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Black Hills National Forest
Northern Hills Ranger District

Mineral Forest Management Project

Environmental Assessment

August 2005

"MINERAL" FOREST MANAGEMENT PROJECT
DRAFT ENVIRONMENTAL ASSESSMENT
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Glossary (Terms, Abbreviations, and Acronyms)

At Risk Community (ARC)
Communities located in the vicinity of Federal lands that are at high risk of wildfire

BA
Basal area – The cross-sectional area of a stand of trees measured 4.5 feet from ground level. The area is expressed in square feet per acre.

BMPs
Best management practices – Land management methods, measures or practices intended to minimize or reduce water pollution.

Board Foot
A unit of timber measurement equaling the amount of wood contained in a board one inch thick, 12 inches long, and 12 inches wide.

Canopy Closure
The percentage of the ground and/or sky covered by vegetation and/or branches. These are perceived from a human point of view perpendicular to flat ground.

CAR
Community at Risk

CCF
One hundred cubic feet (of wood volume).

CFR
Code of Federal Regulations

Classified Road
A road that is needed and intended for long-term vehicle use.

Closed Road
A road that is closed to all vehicular traffic for more than one year.

CMAI
Culmination of mean annual increment – The point at which a tree or stand achieves its greatest average growth, based on expected growth and assumed management systems and utilization standards.

Commercial Thinning
Removing from a stand some of the trees that have reached sufficient size to be manufactured into a product in order to improve tree spacing and increase growth.

Commercial Timber Sale
The selling of timber from National Forest System lands for the manufacture of commercial products such as lumber, plywood, etc.

Cover Type
The vegetative species that dominates a site.

Cull Logs
Logs that do not meet commercial specifications due to defects in the wood.

Decommissioned Road
In this document, a decommissioned road is one that is permanently removed from the transportation system and closed to vehicle use.

DBH
Diameter at breast height – The diameter of a standing tree at a point 4.5 feet from ground level.

EA
Environmental assessment

Forb
Any herbaceous plant other than those in the grass, sedge, and rush families (any non-grasslike plant that has little or no woody material).

FSH
Forest Service Handbook

Fuel Loading
The volume of the available or burnable fuels in a specified area, usually expressed in tons per acre.

Fuel Treatment
Any manipulation or removal of fuels to reduce the likelihood of ignition and/or lessen potential damage and resistance to control.

Habitat Effectiveness
The capability of an area to support elk or deer based on forage, cover, open roads, and the spatial distribution of these factors.

Hard Snag
A dead or partially dead tree composed primarily of sound wood.

Aspen Clone
A group of aspen trees derived from a single tree through vegetative reproduction; for the purposes of this project, at least six trees with minimum stem diameter of four inches within a quarter acre.

IDT
Interdisciplinary team – A group of individuals with different specialized training.

Landing
Any place where round timber is assembled for further transport.

Late Succession
Ecosystems distinguished by old trees and related structural features.

Logging Slash
The wood residue left on the ground after timber harvest (tops, branches, etc.).

Lopping
Cutting fallen tree branches and stems into smaller pieces.

MA
Management area (see p. 3)

MMBF
Million board feet

MIS
Management Indicator Species – Species selected to monitor the effects of planned management activities on populations of wildlife and fish, including those that are socially or economically important.

Mitigation
Actions taken to limit degrading impacts, or to rectify impacts by repairing, rehabilitating, or restoring the affected environment. Compensation of impact by replacing or providing substitute resources or environment. Also may include avoiding impact altogether by not taking a certain action or part of an action.
(40 CFR 1508.20)

Monitoring
The sample collection and analysis of information regarding Forest Plan management practices to determine how well objectives have been met, as well as the effects of those management practices on the land and environment.

NEPA
National Environmental Policy Act of 1969

NFMA
National Forest Management Act of 1976 (amends the Forest and Rangeland Renewable Resources Planning Act)

NFSR
National Forest System Road – A forest road under the jurisdiction of the Forest Service.

Non-commercial Thinning
Removing from a stand some of the trees that are too small to make a merchantable product in order to reduce fuels.

Noxious Weeds
Those plant species designated as weeds by federal state laws; generally non-native, aggressive, and difficult to manage.

PFA
Post-fledging family area (see p. 65)

POL
Products other than logs – Products such as posts, poles, and fiber from trees or parts of trees less than sawlog size.

Prescribed Burning
Controlled application of fire under specified environmental conditions that allow the fire to be confined to a predetermined area while producing the fire intensity and rate of spread required to attain planned resource management objectives.

R2
Region 2 (Rocky Mountain Region of the Forest Service)

Road Density
Miles of road per square mile of land.

Sanitation Treatment
The removal of trees occupied by insect or disease pests to reduce pest populations and limit their spread.

Sawtimber
Trees suitable in size and quality for producing logs that can be processed into lumber; generally those with a diameter of 8 inches or greater.

Seed tree Cutting
A harvest method that leaves a small number of seed-bearing trees singly or in small groups to provide seed for regeneration of the site.

Sensitive Species
Those plant and animal species identified by the Regional Forester for which population viability is a concern.

Shelterwood Seed cutting
A harvest method that leaves a portion of the mature stand in place as a source of seed.

Skidding
Moving logs from the stump to a collecting point.

SS
(Habitat) structural stage (see p. 54)

Unclassified Road
A road that is not constructed, maintained, or intended for long-term vehicle use.

USDA
United States Department of Agriculture

USDI
United States Department of the Interior

VSS
Vegetation structural stage (see p. 66)

Water Influence Zone
The land next to streams and lakes where vegetation plays a major role in sustaining the long-term integrity of aquatic ecosystems.

WUI
Wildland Urban Interface (fuels in areas where humans and their developments meet or intermix with wildland)

WCP
Watershed Conservation Practices
(FSH 2509.25)

INTRODUCTION

The environmental analysis documented here is tiered to:

1. The 1997 Revised Land and Resource Management Plan (Forest Plan) for the Black Hills National Forest.
2. The Final Environmental Impact Statement (FEIS) associated with the Forest Plan.
3. The environmental assessment and decision notice for the 2001 Phase 1 Amendment (Phase 1 Amendment) to the Forest Plan.

The analysis also references the file titled Analysis and Evaluation of the Mineral Project Area (project file). The project file documents the Interdisciplinary Team's (IDT) evaluation of effects.

The Black Hills National Forest is implementing the Forest Plan as required by the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA, P.L. 93-378) and the National Forest Management Act of 1976 (NFMA, P.L. 94-588).

This EA documents the site-specific effects of implementing the proposed actions and alternative actions. The FEIS and Forest Plan are available for review at the Northern Hills Ranger District Office in Spearfish, South Dakota, as well as at the Forest Supervisor's Office in Custer, South Dakota.

Document Structure

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. This is not a decision document. The responsible official will document the decision in a separate Decision Notice.

This document is organized into five parts:

Purpose of and Need for Action: The section includes information on the history of the project proposal, reasons for the project, how the Forest Service informed the public of the proposal, how the public responded, and the resulting issues used to develop alternatives to the proposal.

Alternatives Including the Proposed Action: This section provides a description of the agency's proposed action as well as alternative methods for achieving the stated purpose. This discussion also includes mitigation measures. Finally, the section provides summary tables for each alternative.

Environmental Consequences: This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area.

Agencies and Persons Consulted: This section provides a list of preparers and agencies consulted during the development of the environmental assessment.

Appendices: The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project area resources, may be found in the project file located at the Northern Hills Ranger District Office in Spearfish, South Dakota.

1 PURPOSE OF AND NEED FOR ACTION

1.1 Project Area Location

The Mineral project area is located approximately five miles south of Lead, South Dakota, on Northern Hills Ranger District, Black Hills National Forest. Legal description is shown in Table 1-1.

Table 1-1. Project Area Legal Description

Township	Range	Sections
4 North	2 East	9, 10, 11, 14, 15, 23, 24
4 North	3 East	12, 13, 20, 21, 22, 23, 24, 29
4 North	4 East	7, 8, 9, 17, 18, 19
Black Hills Meridian		

The Mineral project area encompasses approximately 9,241 acres, including approximately 5,798 acres of National Forest System lands and about 3,443 acres of private lands. All proposed activities would occur on National Forest System lands. If necessary, logs may be hauled across private lands where the Forest Service has acquired rights-of-way.

1.2 Management Areas

The Forest Plan assigns a management emphasis to each portion of the Forest to meet multiple-use objectives. For each designated management area (MA), Chapter 3 of the Forest Plan includes a description of desired future condition, goals, objectives, standards, and guidelines. National Forest System land in the Mineral project area is allocated to Management Area 5.1. These areas are managed for wood products, water yield and forage production, while providing other commercial products, visual quality, diversity of wildlife, and a variety of other goods and services.

The project Interdisciplinary Team (IDT) reviewed management area designation and found it appropriate.

1.3 Needs and Opportunities

Actions proposed in the Mineral project area are based on objectives found in the Forest Plan and on needs derived from a comparison of desired conditions and existing conditions. This section reviews these site-specific comparisons and defines the purpose of and need for action in the project area.

1.3.1 Forest Plan Goals and Objectives vs. Existing Conditions

Chapter 1 of the Forest Plan describes multiple-use goals and objectives for management of the Forest. They include protecting basic resources, providing for a variety of life through diverse ecosystems, providing for sustained commodity uses, and providing scenic quality, recreational opportunities, and heritage resource protection.

This section compares relevant Forest Plan direction to the conditions that currently exist in the project area. The comparisons show where needs and/or opportunities for action exist.

Goal 2. Provide for a variety of life through management of biologically diverse ecosystems.

Objective 201: *During the planning period conserve existing hardwood communities and restore historic hardwood communities by 10% Forest-wide over 1995 conditions on sites capable of supporting these communities.*

In 1995, there were 201 acres of hardwoods in the project area. Because pine has encroached into hardwood sites, there are currently 149 acres of hardwoods. Opportunities exist to restore hardwood communities in the project area by removing pine from hardwood sites. This would maintain diversity in forest cover types for wildlife habitat, natural fuel breaks, scenery, and ecosystem health.

Objective 204: *Conserve and manage white spruce, lodgepole pine, limber pine and Douglas-fir.*

Approximately 186 acres of white spruce cover type exist in the project area. Spruce is also present in pine and hardwood stands as an understory or secondary component. No Douglas-fir, lodgepole pine, or limber pine are mapped in the project area. In accordance with Phase I Amendment direction, no vegetation management treatments in spruce stands would take place to avoid decreasing existing or potential American marten habitat.

Objective 205: *Restore grassland (meadow and prairie) communities across the Forest by 10% over 1995 conditions. Determine the restoration potential on a site-specific basis based on landform and soils.*

In 1995, there were 49 acres of grassland mapped in the project area. Approximately 58 acres of grassland (meadow) currently exist, but this is due to map corrections rather than an actual increase in acreage. These areas are generally associated with small meadow inclusions within forested areas. Opportunities exist to remove conifer trees encroaching into these areas and restore/maintain the meadow vegetation.

Objective 207: *Manage at least 5% of the forested landbase for late succession.*
Objective 208: *Provide smaller late succession patches to meet specific resource elements.*

The five percent identified for late succession management includes Management Area 3.7 and smaller stands or patches identified in the Resource Information System (RIS) database. The project area does not contain Management Area 3.7 or any identified smaller stands or patches of late-succession forest as referenced in Objectives 207 and 208. An opportunity exists to move stands towards late succession conditions.

Objective 209: *Manage at least 5% of the forested landbase for the grass/forb structural stage.*

Approximately 192 acres (3.5%) of the forested landbase are in grass/forb structural stage. An opportunity exists to increase this value and move toward the objective.

Objective 211: *In ponderosa pine forested portions of a watershed, maintain an average of 2 hard snags per acre on south-facing slopes and 4 hard snags per acre on north-facing slopes, well dispersed across the watershed through the rotation. Calculate as a per-acre average for the watershed; some acres may have no snags while others may exceed the average. In other forest types maintain an average of 6 hard snags per acre, well dispersed across the watershed.*

Snag data are incomplete. The project area was analyzed assuming that existing snag density does not meet Forest Plan direction. The Forest Plan also requires that, in watersheds not meeting this objective, sufficient large, green trees should be retained to provide future large-diameter snags (standards 2302 and 2306). There is a need and an opportunity to leave sufficient live green trees to provide large-diameter snags throughout the life of the stand.

Objective 217: *Maintain habitat for game and fish populations at the State objectives in effect in 1996.*

The project area provides habitat for game species such as deer, elk, and turkey. High open road density and lack of forage currently compromise habitat values for deer and elk. There is an opportunity to increase habitat values by closing roads and creating forage through cutting of trees.

Objective 218: *Conserve or enhance habitat for resident and migratory non-game wildlife.*
Objective 220: *Conserve or enhance habitat for federally listed threatened, endangered or proposed species.*
Objective 221: *Conserve or enhance habitat for sensitive species and species of special interest (management indicator species).*

The bald eagle and black-footed ferret are threatened or endangered species that may occur in the Black Hills. The project area does not include potential habitat for the black-footed ferret. No other threatened, endangered or proposed species, or their critical habitats, are known to exist in the project area.

Three animal species and three plant species listed as "sensitive" by the Rocky Mountain Region of the Forest Service have been documented in the project area. Habitat for other sensitive and management indicator species exists in the project area.

There is a need to conserve or enhance habitat for these species and an opportunity to do so through thinning, fuel reduction, prescribed fire, and transportation system changes.

Objective 223: *Use management ignited fires and prescribed natural fires to achieve desirable vegetative diversity and fuel profiles on 8,000 acres [across the National Forest] per year for the next decade.*
Objective 224: *Reduce or otherwise treat fuels commensurate with risks (fire occurrence), hazard (fuel flammability), and land and resource values common to the area.*
Objective 227: *Manage 28,900 acres [across the National Forest] of activity fuels and 4,000 acres [across the National Forest] of natural fuels each year during the next decade, consistent with the need to protect life, property and natural resources from the threat of wildfir*e.

Undesirable fuel profiles exist in parts of the project area. There is a need to reduce fuel accumulation in these areas and an opportunity to do so using prescribed fire and mechanical treatments. Years of fire suppression have increased the potential for large crown fires. There is a need to reduce this potential to protect critical plant and animal habitat, timber values, private land, and visual quality in the area. There are opportunities to reduce fuels and large fire potential through timber harvest, fuel treatments, and prescribed burning.

Objective 228: *Within planning units where outbreaks of mountain pine beetles could threaten management objectives, maintain or reduce acreage of ponderosa pine stands that are in medium or high risk condition for infestation.*

A 2004 aerial survey found approximately 1,470 acres in the project area with at least one tree per acre infested with mountain pine beetle (USDA Forest Service 2004c,

2005a). Areas of heavy infestation exist in several locations. Thirty-six percent of the pine acres in the project area are at high risk of mountain pine beetle infestation, and another 17% are at medium risk.

Reduction of acres at high and medium risk is needed to minimize potential loss of resource values to mountain pine beetles. There is an opportunity to reduce the potential for infestation by thinning dense timber stands and conducting sanitation harvests.

Goal 3. Provide for sustained commodity uses in an environmentally acceptable manner.

Objective 303: *Offer 838 MMBF of sawtimber and 21 CCF of roundwood per decade.*

This objective applies to the entire Forest and has not yet been met for the current decade. There is a need to provide sawtimber and roundwood and an opportunity to do so through timber harvest.

1.3.2 Purpose of and Need for Action

In summary, the purpose of and need for action in the Mineral project area is to provide a sustainable supply of commercial timber consistent with Forest Plan standards and guidelines, reduce hazardous fuels, maintain or enhance plant and wildlife habitat, and improve management of the transportation system. Other Forest Plan goals and objectives, such as those associated with scenic integrity and heritage resources, would also be met through implementation of standards and guidelines.

This would move conditions in the project area toward the desired future condition as described in the Forest Plan. The desired future condition includes a greater diversity of forest tree species, sizes, and age-classes, enhanced natural meadows, a better arrangement of forage and cover areas for big game, maintenance of scenic views from main travelways, recreation sites, and residential areas, reduced fire hazards, healthy, vigorous stands of timber in which large trees are produced more rapidly, harvest and reproduction of timber stands that have essentially achieved or passed their peak average volume growth, and protection of all basic resources.

1.4 Issues

1.4.1 Public Involvement

Public involvement in this project began in January 2000 when the Mineral project was listed in the Black Hills National Forest's Quarterly Schedule of Proposed Actions. Public scoping was conducted in September 2002 and included a field tour of the project area. Over 750 individuals and/or groups were contacted during the public scoping phase of the project, including those on the Northern Hills District mailing list, federal, state, and local government officials, permit holders, and private landowners. Eighteen parties submitted written comments by letter or e-mail and two individuals submitted additional comments by telephone (see project file).

1.4.2 Identification of Key Issues

The IDT identified issues relating to the proposed action based on input from Forest Service resource specialists, other agencies, organizations, landowners, and members of the general public. The Forest Service separated the issues into two groups: key (or "significant", as directed by the Council on Environmental Quality (CEQ) regulations (40 CFR 1500.4(g) and

1501.7)) and other issues. The CEQ regulations for implementing NEPA require this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review…." Key issues were defined as those directly or indirectly caused by implementing the proposed action. Other issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) not related to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. A list of other issues and reasons regarding their categorization as non-key is in the project record.

The Forest Service identified five key issues raised during scoping. These issues are:

1. Wildlife habitat

Members of the public and the IDT have expressed concerns about possible direct, indirect, and cumulative effects of the proposed forest treatments on wildlife habitat in or near the project area.

Indicator:

- Condition of habitat for threatened, endangered, proposed, sensitive, and management indicator species.

2. Travel and access management

Proposed transportation changes could have both negative and beneficial effects. There are concerns that road closures could increase wildfire suppression response times and detrimentally affect existing dispersed recreational use of the area. The same road closures could improve wildlife habitat and opportunities for non-motorized recreation.

Indicators:

- Miles of roads open, closed, and decommissioned; road density.
- Deer and elk habitat effectiveness; condition of habitat for other species affected by open roads.

3. Forest health

Various interested parties, including private landowners, county commissioners, and members of the local fire service, expressed concerns about hazardous fuels and mountain pine beetle infestations in the project area. If dense pine stands are not treated, mountain pine beetle infestations could increase to epidemic populations and also increase wildfire potential.

Indicators:

- Acres of thinning.
- Acres of fuel treatments and relationship to private property.
- Acres of pine at moderate and high risk of mountain pine beetle infestation.

4. Timber production

The proposed vegetative management actions could provide raw materials for the local wood products industry and help meet Forest Plan direction for timber harvest.

Indicator:

- Volume of commercial timber that would be produced.

5. Scenic values

Scenic quality of areas proposed for treatment are valued by neighboring landowners and the general public.

Indicator:

- Acres and results of treatment in areas of high scenic integrity.

1.5 Decisions to be Made

This Environmental Assessment (EA) does not document a decision. The purpose of this document is to disclose the effects and consequences of proposed actions and alternatives. The Responsible Official will make decisions based on consideration of this analysis.

Decisions to be made for this project are:

- Should resource management activities such as timber harvest, timber stand improvement, hardwood conservation, meadow enhancement, transportation system management, fuel reduction, monitoring, and associated actions be implemented in the Mineral project area at this time?
- If so, where in the project area should these actions occur? What design criteria and mitigation measures should be applied?

2 ALTERNATIVES

This chapter describes the action alternatives, the No Action Alternative, and the alternatives not considered in detail. This chapter also compares the alternatives in terms of their environmental impacts and their achievement of objectives.

2.1 Description of the Alternatives, Including No Action

This section describes the alternatives considered in detail.

2.1.1 No Action Alternative

The Forest Service Handbook (FSH) requires the Forest Service to study the No Action Alternative in detail, and to use it as a baseline against which impacts of action alternatives can be measured (FSH 1909.15, 14.1). Under this alternative, none of the specific management activities proposed in this document would occur. Ongoing activities such as recreation, fire suppression, and road maintenance would continue. Management activities analyzed under other environmental documents may still occur.

This alternative does not address the objectives and needs for timber harvest, travel management, fuel reduction, or insect infestation.

2.1.2 Alternative 2

Focus of Alternative 2

The specific vegetative treatments associated with Alternative 2, the proposed action, are discussed in the vegetative treatment narrative and identified in Table 2-1 and Figure 2-1, Figure 2-2, Figure 2-3, and Figure 2-4. This alternative emphasizes commercial thinning to reduce risk of mountain pine beetle infestation and to improve long-term forest growth and yield. Shelterwood seedcuts and overstory removal cuts would make progress toward forest diversity goals by changing the forest age-class distribution on the landscape, enhancing meadows, and retaining some large trees for scenery and for future snags to benefit cavity-nesting wildlife. Fuel breaks and fuel treatments would reduce wild fire hazards adjacent to private property.

Approximately 6.2 million board feet (MMBF) (12,400 CCF) of sawtimber and wood products would be produced by this alternative. Sufficient large green trees would be available to provide future large-diameter snags and meet Forest Plan snag requirements. Ongoing activities such as recreation, fire suppression, and road maintenance would continue to occur.

Stand-by-stand proposals are described in the project file. A comparison of alternatives can be found in Section 2.4. A stand map is included in Appendix C.

Vegetation Treatments

- **Commercial thinning.** Thinning of mature or pole-sized trees in pine stands would take place on 1,350 acres to promote optimal growth of remaining trees. The stands would be commercially thinned from below to remove suppressed, defective, and excess trees. Undesirable trees greater than 9" in diameter at breast height (DBH) could be sold commercially. Residual basal area (BA) would average 40 to 80 square feet per acre (about 20 to 30 feet between trees averaging 12" DBH). Following commercial thinning, timber stand improvement would take place to remove defective and excess trees less

than 9" DBH. Conifers would be removed from aspen clones and from an area within 66 feet of each clone.

In several contiguous stands in the southwest corner of the project area, commercial thinning prescriptions would be modified in dense, mature pine stands to move these stands toward late-succession conditions. The resulting forest would consist of unevenly spaced, large-diameter trees. Mountain pine beetle infestation threatens these stands, and removal of subdominant trees would increase the chance that the largest trees would withstand beetle attack. This treatment would take place on 254 acres. Together with adjacent dense, mature stands not proposed for treatment, this would result in a block of 349 acres of forest that would be managed to develop late-succession characteristics. This treatment is not appropriate in dense, mature stands in the eastern part of the project area because beetle infestation has already affected large parts of these stands.

- **Overstory removal.** Overstory trees would be removed from 464 acres to allow the understory to develop. This would be the final harvest of the original stand and an improvement cut for the new stand. Approximately five square feet of BA (about 110 feet between trees 16" DBH) would be retained to provide visual variety and future large-diameter snags. Following removal of the overstory, defective and excess trees less than 9" DBH would be cut. Conifers would be removed from aspen clones and from an area within 66 feet of each clone. Precommercial thinning (see below) of seedling and sapling pines would follow overstory removal.
- **Shelterwood seed cut** is proposed on 193 acres**.** This silvicultural treatment removes some of the mature trees to open the stand and allow young trees to regenerate and become established. Approximately 20 to 30 square feet of BA would be retained to protect the regeneration from climatic conditions (about 40 to 50 feet between trees 14" DBH). This treatment would retain enough large trees to provide a seed source and future large-diameter snags. Following removal of the mature trees, defective and excess trees less than 9" DBH would be cut. Conifers would be removed from aspen clones and from an area within 66 feet of each clone.
- **Meadow enhancement** is proposed on 79 acres. This treatment is designed to reestablish historic meadow conditions in meadow areas that have been encroached on by conifers. All conifers would be removed.
- **Products-other-than-logs (POL)/Precommercial thinning (PCT)** is proposed on 203 acres**.** Trees up to 9" DBH would be thinned to approximately 14'x14' spacing. Objectives are to produce wood fiber, reduce risk of loss to pathogens, improve growth, preclude stand stagnation, and reduce fuel continuity. Suppressed, defective, and excess trees are removed. POL consists of trees generally 5-9" DBH. Trees in this size range may or may not be merchantable, depending on market conditions.
- **Sanitation.** Mountain pine beetle populations are at high levels in parts of the project area and there is potential for further infestation. If further infestation occurs, cutting of beetle-infested trees (sanitation) would take place where necessary on up to 500 acres. Each sanitation harvest proposal would be field-reviewed by resource specialists before implementation and would comply with Forest Plan direction and design criteria. No new permanent roads would be constructed. Intent of this treatment would be to limit the effect of the mountain pine beetle attack and preserve the characteristics and integrity of the stands.
- **Precommercial thinning** is proposed on 763 acres. Trees up to 5" DBH would be thinned. Objectives are to reduce risk of loss to pathogens, improve growth, preclude

stand stagnation, and reduce fuel continuity. This treatment does not appear on Figure 2-1 or Figure 2-2 where it would follow overstory removal.

- **Fuel treatments,** including prescribed burning and fuel breaks, are proposed for a total of 1,276 acres. The total acreage in the following discussions of individual treatments exceeds actual fuel treatment acres because approximately 20 acres of fuel break would overlap a prescribed burn.

  Prescribed burns are proposed on 1,127 acres. Parameters would include no more than 10% allowable mortality in the overstory and no more than 50% in trees less than 9" DBH. A detailed prescribed burn plan would be prepared and approved prior to burning to address safety, escape contingencies, and resource considerations. Approximately 946 acres of prescribed burning would overlap commercial thinning (844 acres), meadow enhancement (37 acres), overstory removal (24 acres) and shelterwood seed cut (41 acres).

  Fuel breaks are proposed on 169 acres to reduce fuel loads adjacent to roadways and private land. Mechanical methods (chipping, mulching, etc.) would be used to reduce the density of trees up to 9" DBH. Remaining trees would be spaced at approximately 16'x16' and would consist of larger, well-formed trees. Approximately 28 acres of fuel break would overlap commercial thinning (11 acres), pre-commercial thinning (3 acres), and shelterwood seed cut (14 acres).

  Activity fuels. Treatment of logging slash after timber harvest is a provision of standard timber sale contracts. Mechanical and/or burning treatment of these activity fuels would take place in all treatment units where fuel loading would exceed Forest Plan direction.

  Wildland Urban Interface and Communities At Risk. Alternative 2 would treat fuels on approximately 185 acres designated as Wildland Urban Interface (WUI) and approximately 91 acres adjacent to Communities at Risk (CARs). These acres are included in the fuel treatment acres identified above.

Table 2-1. Vegetation Treatments - Alternative 2

Vegetation Treatments	Acres
Commercial thinning	1,350
Overstory removal	464
Shelterwood seed cut	193
Meadow enhancement	79
Products other than logs/Precommercial thinning	203
Precommercial thinning	763
Fuel treatment (prescribed burning)	1,127
Fuel treatment (fuel breaks)	169

Portions of treatments overlap.

Transportation System and Travel Management

Objectives of proposed travel management include reducing maintenance costs and negative effects on wildlife habitat, soils, and water while retaining a transportation system that meets current and future resource management needs. From a soil and watershed standpoint, the specific objective of road decommissioning and road storage is to control erosion by decreasing the production, interception, and rapid transport of runoff by restoring or augmenting the natural drainage of the road template, and decreasing sediment transported to waterways. Measures may include addition, replacement, upgrade, or removal of existing non-functional drainage structures

(e.g., culverts); ripping to remove ruts; re-contouring; installation of waterbars or rolling dips; placement of slash and boulders; tree planting; and revegetating. Identified reconstruction and/or maintenance that is necessary for implementation of this project would be completed prior to road use. Work on other roads would take place as funding allows.

It would be necessary to acquire road easements across private land to harvest stands 81128-05, 81128-07, 81128-38, 81128-42, and 81128-77, located in Sections 7, 17, and 18, T. 4N., R. 4E., and stand 0811280072, located in Section 8, T.4N., R.4E (see Appendix C). These treatments would reduce mountain pine beetle infestation and hazardous fuels. Negotiations are currently in progress to secure easements to these parcels from the affected landowners. In the event that the easements cannot be acquired and it is not possible to harvest the units off of existing roads, the units would not be harvested in this treatment cycle.

Transportation management changes are depicted in Table 2-2 and Figure 2-3.

- **New construction**. Approximately 3.1 miles of new road would be constructed to reach stands in the western part of the project area and to provide access to a log landing off NFSR 534. Newly constructed roads would be closed following completion of the project.
- **Reconstruction.** Approximately 10.4 miles of existing road would be reconstructed. Reconstruction would consist mainly of adding drainage structures to prevent the road surface from becoming muddy, and adding or improving surfacing.
- **Maintenance.** Minor maintenance would take place on approximately 7.7 miles of existing road. This would involve blading ruts, cleaning ditches, and other minor repairs where problems exist.

Travel Management

- **Roads currently open changed to year-long closure.** Approximately 4.9 miles of roads that are open would be closed year-round.
- **Decommissioning.** Approximately 1.5 miles of National Forest System Roads (NFSRs) and 9.0 miles of unclassified roads would be decommissioned. One of the NFSRs proposed for decommissioning is essentially already closed and not driveable. The other two NFSRs proposed for closure are in close proximity to private property and not necessary for administrative purposes. The unclassified roads proposed for closure were not built or sanctioned by the Forest Service, have not been maintained by the Forest Service, and are not needed for access for multiple uses in the Project Area. Based on available funding, the roads would be decommissioned in accordance with Forest Service road management policies (FSM 7700).

Table 2-2. Transportation Management - Alternative 2

Transportation System Changes	Miles
New road construction	3.1
Road reconstruction	10.4
Road maintenance	7.7
Roads decommissioned	10.5

Design Criteria

The following design criteria apply to Alternative 2.

1. Fuels

a) In precommercial thinning treatments and fuelbreaks, mechanical treatment of fuels would be used if possible. Areas not treated mechanically would be manually thinned with the resulting slash piled and burned or otherwise disposed of.

b) Whole-tree yarding would be the preferred method of slash treatment for all harvest activities except overstory removals. If whole-tree yarding is used in overstory removal treatments, regeneration would be protected. Methods may include but are not limited to designation of skid trails by the sale administrator and directional felling of trees to skidding corridors. Whole-tree yarding would be used where feasible adjacent to private property. Lop-and-scatter fuel treatment would be acceptable where fuel loading objectives would be met.

2. Soil and Water

a) Mandatory management requirements found in the Watershed Conservation Practices (WCP) Handbook (Forest Service Handbook 2509.25) and State of South Dakota Best Management Practices (BMPs) would be applied to proposed activities for protection of soil and water.

b) Many proposed activities would take place on soils identified by the Lawrence County Soil Surveys as having a high erosion risk. Specific implementation criteria have been developed to meet the soil and water standards in the Forest Plan and the South Dakota Best Management Practices. The specific areas of concern are identified in the project file.

c) If wet soils or slide areas are identified during project layout or implementation, the District Hydrologist would be consulted prior to any ground-disturbing activities to identify appropriate avoidance measures.

d) Cutting unit boundaries in sites 82102-07 (commercial thin), 82102-14 (precommercial thin), and 82108-13 (overstory removal) would remain outside the Water Influence Zone associated with adjacent wetlands. See stand map in Appendix C.

e) Reconstruction of NFSR 248.1A would be conducted using filter strips or other means to prevent sediment from entering the adjacent wetland. Heavy equipment would not enter the wetland. Material would not be excavated from or stored in the wetland.

3. Snags and Down Woody Material

a) Retain five square feet per acre of basal area in the largest size class available in overstory removal treatments for future snag recruitment.

b) Existing snags would be retained unless they pose safety hazards to workers or the public. Where possible, any snags cut because they are safety hazards would be left on site rather than salvaged or skidded to landings.

c) If standard 2308 (retention of down woody material) conflicts with direction regarding fuel loading or visual quality, standard 2308 would take precedence.

d) Cull logs or felled cull trees greater than 10” DBH would be left on site or returned to the site in stands where whole-tree skidding takes place to contribute to nutrient cycling and provide habitat for small wildlife species

4. Sensitive Plants

a) Known occurrences of sensitive plants and high-quality habitat would be protected from disturbance during proposed activities. High-quality habitat and areas of known occurrences are identified in the botanist's report in the project file. Treatment boundaries near these areas would be established under direction of the botanist to exclude high-quality habitat and areas of known occurrences. Mechanical disturbance (e.g., due to landing and skid trail placement) that might occur outside of treatment units would be assessed by a botanist prior to implementation.

b) Bristle-stalk sedge (a sensitive species) occurs in stand 81128-13. This stand is proposed for commercial thin under Alternative 2 and is adjacent to a proposed POL/PCT and meadow enhancement in both action alternatives. This occurrence and surrounding suitable habitat would be designated as "no entry"for all activities. Treatment boundaries around this area would be established in coordination with a botanist.

c) One large round-leaf orchid (sensitive species) occurrence is surrounded by units proposed for prescribed burns and commercial thins under both action alternatives (stands 70204-05, 70204-07, 70204-08, 70204-21, and 70204-22). This occurrence and surrounding suitable habitat would be designated as "no entry" for all activities. Treatment boundaries around this area would be established in coordination with a botanist.

d) No treatment would take place in the approximately six-acre western lobe of stand 0702030014 due to steep slopes and moist soils.

e) Fuel treatments proposed under Alternative 2 on Strawberry Hill (stands 82109-13, 82109-36, and 82109-23) would focus on removal of live and dead bug-infested trees and thinning excessive stems to create canopy gaps. The lower parts of the slope, where moisture increases and the stands become dominated by white spruce and moss, are suitable sensitive plant habitat. Treatment boundaries adjacent to this area would be established in coordination with a botanist.

f) The standard North Zone seed mix (specifications dated April 29, 2004 or later) would be used for reseeding disturbed areas.

5. Noxious Weeds

a) Guidelines to prevent the spread of noxious weeds due to prescribed fire, road work, and timber harvest activities, identified in the BHNF Weed Management Plan (approved January 18, 2003), would be included as appropriate in contracts and permits issued as part of this project. Post-sale activities may also include herbicide treatment of noxious weeds in disturbed areas.

b) If activities are planned in areas infested with noxious weeds considered to be at high risk of spread, off-road equipment associated with the activity would be washed before leaving the site to prevent spread of weeds. Noxious weeds have been found in parts of the following sites proposed for treatment:

Location	Site/s
70203	06, 09
81128	10, 72
82102	03, 05, 08, 19
82108	13, 17, 22, 35, 38, 69
82109	28, 33

6. Rangelands

a) All pasture gates would be identified on Timber Sale Area maps and kept closed during the grazing season, generally June through mid-October. Maintained fences would be protected during logging operations.

b) Roads, landings, and slash piles would be located out of meadows and draw bottoms whenever possible to reduce loss of forage.

c) Cattleguards, fences, spring developments, and water storage tanks would be protected and maintained for the duration of the proposed activities. These improvements would be identified on Sale Area maps. Range improvements damaged during implementation of proposed activities would be repaired or replaced. Timber sale purchasers would be responsible for maintaining cattle guards put in place to facilitate timber sales for the duration of the timber sale contract period.

d) If proposed activities result in the loss of an existing natural barrier that prevents unintended cattle movement, construction of a replacement fence or other barrier would be coordinated between the district range program and the resource area responsible for the change.

7. Recreation

a) Snowmobile trails would be shown as improvements on Timber Sale Area maps and protected during harvest operations. An evaluation of the potential for conflicts between logging and trail use would be made at the time of timber sale appraisal and contract preparation. If conflicts appear likely, logging would be restricted in affected areas between December 1 and March 31 unless a logical and desirable alternative snowmobile route is identified. Only those units and/or roads in conflict would be restricted so that logging operations could proceed in the remainder of the sale area. Stands proposed for commercial harvest that are currently crossed by snowmobile trails include:

Location	Site/s
82102	07
82108	06, 17, 30, 31, 33, 46, 47, 48

b) Winter operations of timber sale units that necessitate skidding across a snowmobile trail but do not otherwise affect the trail may be allowed. Determination would be made on a case-by-case basis, with crossings permitted only at locations approved by the sale administrator and with proper cautionary signing installed by the contractor.

c) Appropriate signing or other cautionary measures would be implemented to protect public safety. Implementation of these measures would be the responsibility of the party initiating the action (e.g., logging contractor, prescribed fire manager).

8. Heritage Resources

a) All culturally sensitive areas, Traditional Cultural Properties, and sites eligible or potentially eligible to the National Register of Historic Places would be avoided under proposed activities with a 60-meter (200-foot) buffer. Other mitigation identified in the project file for each property would be required during implementation of the project. Heritage site locations or specific mitigation is not identified in this EA to protect site integrity.

b) In the event culturally sensitive areas, Traditional Cultural Properties, or sites eligible or potentially eligible to the National Register of Historic Places cannot be avoided, or new heritage resources are found during implementation of the project, the sale administrator

would stop all activity in the affected area and notify the District Archeologist. Appropriate consultation with the State Historic Preservation Office, Tribal Historic Preservation Offices, Native American tribes, American Indians, and other applicable parties would take place as directed by Section 106 of the National Historic Preservation Act.

9. Scenery

a) Within 300 feet of primary travel corridors (U.S. Highways 85 and 385, Forest Highway 17, and snowmobile trails), whole tree yarding would be used where possible and desirable.

b) Areas of disturbed soil would be recontoured to blend in with the adjacent topography and seeded.

c) Harvest unit boundaries would mimic natural landscape patterns where possible.

d) The Forest Landscape Architect would be consulted on and/or participate in the design and implementation of treatment in stands 70204-15, 70204-29, and 82108-17 to ensure Forest Plan scenic integrity direction is met.

Monitoring

The District ID team would monitor implementation of Alternative 2. All ID team reviews would be documented and a final monitoring report completed after project implementation.

The timber sale administrator or other contract administrators would be responsible for some of the project implementation monitoring. Other resource specialists would monitor specific design criteria and mitigation measures related to their particular resource area. The following monitoring is prescribed for this alternative.

- Foresters would monitor conifer regeneration in shelterwood seedcuts and patch clearcuts one, three, and five years after harvest to assess stocking and need for site preparation or planting.
- The District archeologist would monitor known heritage sites eligible or potentially eligible to the National Register of Historic Places before and after project implementation.
- Prescribed fire managers would establish photo points in prescribed burn units to compare pre- and post-treatment conditions and document fire behavior during implementation.
- Fuels staff would evaluate effectiveness of fuel treatments in reducing fuel loading.
- Fire managers would evaluate burned areas to establish a timeline for maintenance burning.
- Fire and range managers would monitor regrowth of forage after prescribed burns in meadows to determine the need for temporary modification of the livestock grazing system.
- Project managers would monitor revegetation of disturbed and burned areas to determine need for additional measures and noxious weed control.
- Timber and wildlife staff would sample snag densities before and after timber harvest to determine the need for snag creation.
- Silviculture and wildlife staff would monitor oak release treatments to determine effectiveness in increasing structural diversity and tree diameter.
- Wildlife staff would monitor known and possible goshawk nests annually for nesting activity.
- Botany staff would monitor sensitive plant populations near proposed treatment areas populations during project layout and implementation.
- Engineering and hydrology/soils specialists would monitor effectiveness of erosion control measures (seeding, water bars, etc.) one and three years following installation.
- Hydrology/soils staff would monitor soil compaction at a sample of timber sale landings and

harvest units.

- Travel managers and wildlife staff would sample road and area closures for effectiveness.
- Timber sale administrators and hydrology/soils specialists would monitor application and effectiveness of Best Management Practices.
- The District planning team would monitor timber sale layout to evaluate project implementation and assumptions used in the planning process.
- The District planning team would monitor timber sale implementation following sale closure.

Figure 2-1. Alternative 2 Vegetation Treatments (West Half)

Figure 2-2. Alternative 2 Vegetation Treatments (East Half)

Figure 2-3. Alternative 2 Transportation System (West Half)

Figure 2-4. Alternative 2 Transportation System (East Half)

2.1.3 Alternative 3

Focus of Alternative 3

Alternative 3 was developed to emphasize scenery and wildlife habitat values. As compared to the proposed action, this alternative would leave more dense stands on north-facing slopes for wildlife habitat. To emphasize scenic values and benefit species that use larger trees, there would be no overstory removal treatments.

This alternative includes hardwood enhancement treatments to remove conifers that are encroaching on aspen. Conifers would be removed from within and up to 120 feet from existing clones. Between aspen clones, conifers would be thinned to 40 to 80 square feet of basal area (about 20 to 30 feet between trees 12" DBH). All conifers would be removed from two sites (70203-09 and 81128-07). Some of the stands identified for hardwood enhancement are currently identified as having a ponderosa pine overstory. The treatment would convert these stands to aspen cover type.

Similar to Alternative 2, this alternative includes fuel breaks and fuel treatments. Fuel management would, however, take place on fewer acres. Approximately 776 acres of prescribed burning would overlap proposed commercial thinning (406 acres), meadow enhancement (37 acres), hardwood enhancement (292 acres), and shelterwood seed cut (41 acres). Approximately 22 acres of fuel break would overlap commercial thinning (11 acres), pre-commercial thinning (3 acres), and shelterwood seed cut (8 acres). Alternative 3 would treat fuels on approximately 170 acres designated as WUI and on 87 acres adjacent to CARs.

Ongoing road maintenance, noxious weed management, grazing, and activities in existing timber sales would continue according to existing management plans.

Treatment types would be the same as those described under Alternative 2 (pp. 9-12) with the addition of hardwood enhancement (321 acres). This alternative would produce approximately 3.6 MMBF (~7,200 CCF) of sawtimber and wood products.

Easements may be necessary to harvest stands 81128-05, 81128-07, 81128-38, 81128-42, and 81128-77 located in Sections 7, 17, and 18, T. 4N., R.4E., as described on p. 12 for Alternative 2.

Acres and miles associated with Alternative 3 are reflected in the following tables and figures. Stand-by-stand proposals are described in the project file. A comparison of alternatives can be found in Section 2.4. A stand map is included in Appendix C.

Table 2-3. Vegetation Treatments - Alternative 3

Vegetation Treatments	Acres Treated
Commercial thinning	592
Shelterwood seed cut	427
Meadow enhancement	79
Products other than logs/Precommercial thinning	203
Precommercial thinning	28
Hardwood enhancement	321
Fuel treatments (prescribed burning)	1,125
Fuel treatments (fuel breaks)	89

Portions of treatments overlap.

Table 2-4. Transportation Management - Alternative 3

Transportation System Changes	Miles
New road construction	1.8
Road reconstruction	8.2
Road maintenance	5.2
Roads decommissioned	10.1

Design Criteria

Design criteria found on pp. 13-16 apply to Alternative 3, with the following modifications.

2d: Delete (treatments are not proposed in these stands under Alternative 3).

2e: Delete (248.1A is not proposed for reconstruction under Alternative 3).

5b: Sites proposed for treatment in which noxious weeds have been found:

Location	Site/s
70203	06, 09
81128	10
82102	03, 05, 08, 19
82108	17, 35, 38, 69

7a: Sites proposed for commercial treatment currently crossed by snowmobile trails:

Location	Site/s
82108	06, 17, 30, 31, 33, 46, 47, 48

8e: Delete (treatment is not proposed in these stands under Alternative 3).

13b: Delete (treatment is not proposed in this stand under Alternative 3).

Monitoring

Monitoring items found on p. 16 apply to Alternative 3, with the following addition.

- Silviculture and wildlife staff would monitor hardwood enhancement treatments to determine effectiveness in increasing hardwood extent and structural diversity.

Figure 2-5. Alternative 3 Vegetation Treatments (West Half)

Figure 2-6. Alternative 3 Vegetation Treatments (East Half)

Figure 2-7. Alternative 3 Transportation System (West Half)

Figure 2-8. Alternative 3 Transportation System (East Half)

Treatment Timing

The National Forest Management Act generally prohibits the harvest of stands before they reach their maximum growth rate (NFMA, 16 U.S.C. 1604(m)). Exceptions in the law allow the harvest of individual trees, or even parts or whole stands of trees, before this time to thin and improve timber stands and salvage damaged stands of trees (part m1 of the law). Further exceptions are allowed in order to achieve multiple-use objectives other than timber harvest (part m2).

Alternatives 2 and 3 would harvest some stands before their maximum potential growth rate has been reached. These harvest treatments are consistent with the exceptions provided in part m2 of the law, and include precommercial thinning, commercial thinning, hardwood enhancement, meadow enhancement, products-other-than-logs thinning, sanitation, and fuel treatments. These treatments are proposed to meet Forest Plan multiple-use objectives stated earlier in this assessment.

2.2 Consistency with Forest Plan and Phase 1 Amendment

The Forest Plan and Phase 1 Amendment contain direction in the form of Forest-wide and management area goals, objectives, standards, and guidelines. Standards are limitations on management activities. Deviation from a standard requires a Forest Plan amendment. A guideline is a preferred course of action, and deviation is permissible if the Responsible Official documents the reasons for the deviation. Under the Phase 1 Amendment, certain guidelines are to be treated as standards (USDA Forest Service 2001a). Goals are broad, general statements of desired end results of management, and objectives describe measurable desired results to work towards achieving goals.

This project is within the scope of the Forest Plan analysis, and contains no unusual or extraordinary features or circumstances. A full accounting of project compliance with Forest Plan and Phase 1 Amendment direction is located in the project file. Both action alternatives considered in detail meet Forest Plan and Phase 1 Amendment direction.

2.3 Alternative Development Process, Including Alternatives Considered but Eliminated from Detailed Study

The ID team developed the proposed action to meet objectives identified through a comparison of existing conditions and Forest Plan direction. Timber harvest, fuel treatments and transportation proposals were modified as a result of public scoping and refinement of resource condition information. This revised proposed action formed Alternative 2.

Alternative 3 was developed to emphasize scenery and wildlife values. It differs from Alternative 2 by retaining more dense forest habitat and enhancing more aspen stands.

The ID team also considered other alternatives. Following are brief descriptions of alternatives not considered in detail and the reasons for eliminating them from detailed analysis.

Emphasize forest health treatments.
Several comments were received suggesting an alternative that emphasized forest health and a treatment of all or nearly all stands susceptible to mountain pine beetle infestation. Other comments suggested treating all stands at high risk from wildfire. Both action alternatives include proposals to substantially reduce acreage at moderate and high risk of beetle infestation and reduce fuels to avoid catastrophic wildfire, consistent with Forest Plan direction. Acres at high risk of infestation would decrease by 42% under Alternative 2 and by 34% under Alternative 3. It would be not be possible to treat all areas susceptible to beetle infestation or fire without substantial negative effects on other resources. Areas left untreated under Alternative 2 either were treated recently or could only be reached for mechanized treatment by construction of lengthy roads on steep, unstable, or highly visible slopes. Extensive manual treatments were not proposed due to prohibitive cost.

Maintain sufficient road infrastructure to support multiple uses.
Comments were received expressing the opinion that the project would close too many existing roads. These commentators wanted the project to maintain sufficient road infrastructure to support recreational uses, fire suppression, and management access. Both action alternatives include road closures but are designed to maintain sufficient roads to facilitate multiple-use management of the area. No roads that are likely to be needed for future management would be decommissioned. For further information, refer to the roads analysis in the project file.

No commercial timber output.
A comment was received suggesting no commercial timber be harvested during vegetative treatments. While some of the project's objectives could be met without the use of commercial timber harvest, commercial harvest can be useful in accomplishing these objectives. The timber purchaser completes much of the work as part of timber harvest, and timber sales provide funding for post-sale activities via Knutsen-Vandenberg. Appropriated funding is rarely sufficient in itself to accomplish needed vegetation management. Moreover, the Forest Plan allocated the area to MA 5.1, where timber harvest is an appropriate tool for accomplishing management objectives. Given these factors, the Responsible Official chose not to analyze this alternative in detail.

Decommission the maximum amount of roads.
A comment was received suggesting that an alternative be developed that only decommissioned roads or decommissioned the maximum amount of roads. Both action alternatives would decommission about 10 miles of road. The roads analysis determined that these roads could be permanently closed without hindering future management. The planning team felt that removal of additional roads at this time could foreclose future management options. An alternative consisting solely of road closures was not considered in depth due to the area's allocation to MA 5.1 and the identified needs associated with widespread mountain pine beetle infestation and presence of hazardous fuels.

Change management area designations.
A request was received to change all Management Area 5.1 to 4.1 (Limited Motorized Use and Forest Products Emphasis). The same respondent suggested designating all structural stage 4C (mature, dense) stands as Management Area 3.7 (Late Successional Forest Landscapes).

The Forest Plan assigned a management emphasis to each part of the National Forest. This designation can be changed at the project level if another designation is found to be more appropriate. MA 4.1 was assigned to areas suitable for non-motorized recreation and production of timber, forage, visual quality, and a diversity of wildlife (USDA Forest Service 1997a). "Motorized road travel is limited to designated routes… [which] will vary over time based on the need to do vegetative management. Generally the road system will be closed to motorized travel" (Forest Plan guideline 4.1-9102). Off-road motorized travel is prohibited (standard 4.1-9101). MA 5.1 in the Mineral project area includes US Highways 85 and 385, Forest Highway 17, and

NFSRs 248 and 534, all of which access private land, are used for recreational and other purposes, and would not be appropriate to close. Therefore, the Responsible Official decided not to analyze this alternative in detail.

MA 3.7 is assigned to areas hundreds or thousands of acres in size that currently include late-succession forest and can be managed for these characteristics on a landscape scale. Assigning this designation to individual stands as suggested would not meet the landscape-level intent of the management area. For these reasons, this alternative was not analyzed in detail.

2.4 Comparison of Alternatives

Table 2-5 compares activities proposed under the alternatives. Figures are approximate. Treatment definitions and descriptions are located starting on page 9. Hardwood enhancement is described on p. 22.

Table 2-5. Comparison of Alternatives

Activity	No Action Alternative	Alternative 2	Alternative 3
Vegetation Management Treatments (in acres rounded to the nearest whole)			
Commercial thinning	0	1,350	592
Overstory removal	0	464	0
Shelterwood seed cut	0	193	427
Meadow enhancement	0	79	79
Products other than logs/ precommercial thinning	0	203	203
Precommercial thinning	0	763	28
Hardwood enhancement	0	0	321
Fuel treatments (prescribed burning)	0	1,127	1,125
Fuel treatments (fuel breaks)	0	169	89
Transportation Management (in miles rounded to nearest tenth)			
New road construction	0	3.1	1.8
Road reconstruction	0	10.4	8.2
Road maintenance	0	7.7	5.2
Open roads	42.5	30.5	30.3
Roads open seasonally	0.2	0	0
Closed roads	14.9	15.9	15.0
Roads decommissioned	0	10.5	10.1

Table 2-6 displays the response of each alternative to the issues. All figures are approximate.

Table 2-6. Response of Alternatives to Issues

Issue	No Action Alternative	Alternative 2	Alternative 3
Issue 1: Effects of Vegetation Treatments on Wildlife Habitat			
Threatened and endangered species	No effect	No effect	No effect
Sensitive species	N/A	May adversely impact some individuals, but no loss of viability on BHNF	May adversely impact some individuals, but no loss of viability on BHNF
Management indicator species	N/A	No negative effects on trend of habitat or population	No negative effects on trend of habitat or population
Issue 2: Travel and Access Management			
Miles of open roads	42.5	30.5	30.3
Miles of road open in summer	.2	0	0
Miles of road closed year-round	14.9	15.9	15.0
Miles of road decommissioned	0	10.5	10.1
Miles of road per square mile	4.1	3.3	3.1
Deer and elk habitat effectiveness	Habitat stable	Habitat effectiveness improves or remains stable	Habitat effectiveness improves
Issue 3: Forest Health (Fuels and mountain pine beetle infestation)			
Acres of commercial, POL, and precommercial thinning	0	2,316	823
Acres of prescribed burning	0	1,127	1,125
Acres of fuel breaks	0	169	89
Acres of WUI treated	0	185	170
Acres treated adjacent to CAR	0	91	87
Acres of pine at risk of mountain pine beetle infestation	Low: 2,379 Medium: 914 High: 1,881	Low: 3,811 Medium: 441 High: 922	Low: 3,351 Medium: 608 High: 1,215
Issue 4. Timber Production			
Potential sale volume	N/A	6.2 MMBF (12,400 CCF)	3.6 MMBF (7,200 CCF)
Percent of National Forest System lands in project area suitable for timber harvest identified for treatment	N/A	54%	38%
Issue 5. Effects of Vegetative Treatment on Scenic Values			
Acres of treatment in high Scenic Integrity Objective areas	0	1,054	733

** Some fuels treatments overlap other treatments, as explained under the discussion of each alternative.*

3 ENVIRONMENTAL CONSEQUENCES

This section forms the scientific and analytical basis for the comparison of the potential environmental effects of the alternatives. In determining potential environmental consequences of each alternative, the IDT considered the following:

- The probable consequences of each alternative on environmental resources
- Achievement of project objectives
- Adherence to Forest Plan standards, guidelines and objectives
- Compliance with federal and state laws and regulations

Chapter 3 of the Forest Plan FEIS (Affected Environment and Consequences) discusses the short and long term effects, irreversible and irretrievable commitment of resources, and adverse environmental effects that cannot be avoided when implementing management practices in the Black Hills forest environment. The projects and effects described in this EA are the same as those anticipated by the Forest Plan FEIS, and therefore the effects are not repeated here. This EA is tiered to Chapter 3 of the FEIS to avoid repetition and to allow this description to focus on the site-specific effects that would result from implementation of the proposed alternatives.

3.1 Cumulative Effects Area and Activities

The cumulative effects analysis area for most resources is the three 7th-level watersheds that overlap the project area (Figure 3-1). This area includes 13,625 acres of National Forest System lands and 10,115 acres of land in other ownerships for a total of 23,740 acres. If analysis of a particular resource discipline dictates a different cumulative effects area, that area is defined in the cumulative effects discussion for the involved resource.

3.1.1 Past Actions

Black Hills forests have been subject to widespread modification since the 1870s. Forest vegetation has been altered in the last 130 years through timber harvest, fire suppression, introduction of exotic species, human-caused wildfires, development of private property, and grazing by domestic livestock. As a result, more of the landscape is forested, though the trees are generally smaller (Parrish et al. 1996, USDA Forest Service 1996 p. III-136). The water table is likely to be lower in drainages now than when there were numerous beaver dams, causing changes in plant communities.

The project area is dominated by the ponderosa pine vegetation series, with smaller areas of white spruce, quaking aspen, and paper birch (Shepperd and Battaglia 2002). Application of silvicultural systems and fire suppression over the last century are responsible for the structure, composition, and appearance of the majority of this existing forest, but the effects of wildfires and unregulated timber harvest in the late 1800s are still evident in places.

Forest Service timber sales that have taken place completely or partly within the cumulative effects area since the late 1980s include Boomer, Butte, Dano, Park, Strawberry, and Woodville. Post-sale activities such as precommercial thinning and fuel treatment have also taken place.

Extensive mining, primarily for gold, has taken place adjacent to the project area and on private land in the project area. Many test pits and remnants of small mines are found on NFS lands in the project area.

More than 96 miles of road have been developed in the project area on both public and private land. Private land has also been subject to mining, timber harvest, livestock grazing, water diversions, and both residential and recreational development. The extent of each type of past activity is listed below.

Grazing. Livestock grazing has occurred here for over a century. Cattle currently graze NFS land in the cumulative effects area in Bear Butte and Upper Elk Creek allotments. Grazing season is generally June through September.

Mining. Evidence of historic mining and mineral exploration is widespread. The inactive, approximately 100-acre Gilt Edge Mine is located on non-NFS land at the eastern edge of the cumulative effects area (Anchor Hill). Mining historically degraded water quality in project area watersheds. Most streams now support beneficial uses, but some sections are still negatively affected (see p. 42).

Noxious Weeds. Herbicide application has occurred along roads, in timber sale log landings, and at other areas of soil disturbance.

Private Land. The small settlements of Cheyenne Crossing and Elmore, as well as a number of scattered residences, are in Spearfish Canyon adjacent to the project area. The Lead Country Club golf course is located off Forest Highway 17. Numerous residences exist in various subdivisions near Englewood, Brownsville, US Highway 385, and Strawberry Hill. Recreational developments such as campgrounds exist off US Highways 85 and 385. Mining, livestock grazing, water developments, road construction, and timber harvest have also occurred on these and other private lands.

Recreation. There is one Forest Service picnic ground and fishing pond in the cumulative effects area. State-operated snowmobile trails cross the area. ATVs are used on roads and some user-created trails. Recreational activities popular in the cumulative effects area include sightseeing, hunting, hiking, fishing, recreational driving, ATV riding, and snowmobiling. Several acres of the Deer Mountain ski area are in the cumulative effects area.

Roads. About 1.7 miles of road were built outside the project area but in the cumulative effects analysis area for the Woodville timber sale in the mid-1980s. Two and a half miles of road were built in the far western part of the cumulative effects area for the Park timber sale in the mid-1990s. A quarter-mile of road was constructed in 2003 for the Hanna timber sale on the southern edge of the cumulative effects area.. Most other NFS roads have been in place for several decades.

Timber Harvest. Timber sales completed since the late 1980s include the following acreages within the cumulative effects area:

Table 3-1. Past Timber Sales

Timber Sale	Acres	Year/s
Boomer	315	Late 1990s
Butte	965	Late 1980s
Dano	27	Early 2000s
Park	511	Early 2000s
Strawberry	344	Early 1990s
Woodville	367	Early 1990s
Total	2,529	

Other Vegetation Management. Precommercial thinning has taken place on approximately 250 acres. Aspen was regenerated on approximately 42 acres on Dutch Flats in 1988. Fuel breaks were constructed on BLM land in the cumulative effects area in 2003 and 2004.

Fire. The Grizzly Gulch wildfire burned 190 acres in the cumulative effects area in 2002, almost entirely on private land. Fire intensity was low to moderate in most of these areas with patches of overstory mortality. The Camp 5 Fire burned approximately 700 acres to the east of the cumulative effects area in April 2005.

3.1.2 Current Actions

The active Hanna timber sale includes 617 acres in the cumulative effects area. Livestock grazing occurs on National Forest System and private lands. No mining operations are currently active. Fire suppression takes place as needed. Maintenance of roads and electric utility lines continues. Water is diverted in various locations to livestock watering tanks.

3.1.3 Reasonably Foreseeable Future Activities

Reasonably foreseeable future actions in the cumulative effects area include fire suppression, treatment of noxious weeds, road and utility maintenance, livestock grazing, and recreation. Other timber harvest may take place in the future on public lands, but specific locations and treatment types are not known at this time. The extent of each type of future activity is listed below.

Fuel Treatment. Landing piles in the Hanna sale will be burned and seeded or chipped and removed. POL thinning is proposed on about 260 acres in the Hanna sale.

Wildlife Habitat Improvement. Hardwood and meadow restoration treatments are each proposed on approximately five acres in the Hanna sale area.

Noxious Weed Treatment. Continued treatment of known infestations and continued survey for new infestations of noxious weeds is anticipated.

Private Land. The Grizzly Gulch land exchange is expected to affect about five acres of isolated NFS land on the northern edge of the project area. No activities are proposed in this area. Subdivision and development of private land is likely to continue on other private land parcels. No other changes are known at this time.

Recreation. There are no foreseeable changes in recreational use of the project area.

Roads. Road maintenance will continue as needed.

Timber Harvest. No additional timber harvests are proposed at this time.

Figure 3-1. Cumulative Impacts Analysis Area – 7th Level Watersheds

3.2 Physical Consequences

3.2.1 Fuels

This section summarizes the Fire and Fuels report, located in the project file, which contains data, research references, and detailed analysis of effects on fuels. Project design features discussed on pp. 13-16 are intended to ensure that the project meets Forest Plan direction and applicable laws and regulations. A site-specific burn plan would be prepared prior to all broadcast burns to address safety, air quality, and other concerns.

Affected Environment

The Mineral project area is in the Spearfish Canyon and Custer Peak compartments of the Wildfire Prevention and Analysis Plan (USDA Forest Service 1997b). This document indicates that the Spearfish Canyon compartment has high fuel hazards, a high risk for potential wildfire ignition, and high natural and developed values where destruction by wildfire would be unacceptable. The Custer Peak compartment also has a high risk of wildfire ignition, high values, and moderate fuel hazards.

The Mineral area is dominated by ponderosa pine, whose natural history generally includes relatively low-intensity fires occurring at less than 35-year intervals. There are also aspen stands, a forest type that normally burns at less frequent intervals. Regardless of cover type, most forest stands in the area have not burned as recently or as often as they would without fire suppression. Timber harvest has prevented some buildup of natural fuels, this has probably been less than historically removed by fire. The net result is that fuel buildup and fire hazards are currently above the historic norm, and there is potential for high-intensity crown fires.

There are several Communities at Risk (CARs) within or adjacent to the project area. These include Cheyenne Crossing, Englewood, Galena, Lead, and Deadwood. Wildland-urban interface areas are increasing within the project area. This expansion will likely continue as more private inholdings are subdivided and developed. Currently there are approximately 75 houses or cabins inside or directly adjacent to the project area and another 250 structures within a mile of the boundary. A crown fire in this area would require structure protection for at least some of the residences depending on the direction of fire spread. In order to effectively protect a community located in a high fire hazard environment, it is desirable to perform fuel treatment projects at a range of distances from homes.

Although most of the few fires in the project area in the last 20 years have been relatively small, the Grizzly Gulch fire of 2002 burned approximately 11,000 acres immediately adjacent to the project area and 190 acres in the project area. This fire resulted in the evacuation of the towns of Lead, Deadwood, Galena, and several outlying subdivisions.

Direct and Indirect Effects

No Action Alternative

Without treatment , surface fuels, ladder fuels, and canopy fuels would be expected to continually increase. Beetle infestation and storm events could further increase surface fuels.

Potential fire behavior in the project area was modeled with the Forest Vegetation Simulator. Historic weather data from the Nemo Remote Automated Weather Station (RAWS) were analyzed. Modeling potential fire behavior using these weather parameters represents the "average worst" conditions that can be expected on 90% of all the days that fires occur (see project file for additional information). Under current fuel conditions, fires would be expected to reach the tree crowns on approximately 1,547 acres (27% of NFS lands) when wind speeds are 20 miles per hour. Crown fires on the same days, under current fuel conditions with no action, could be expected to sustain themselves and run when wind speeds are 35 miles per hour. The model shows that potential fire behavior would also be expected to intensify under the no action alternative.

Alternative 2

No large, overall changes in surface fuels would be expected during the first five years after treatment, because some actions would remove surface fuels and others would, to a degree, add to them. In general, slash produced from commercial thinning and harvesting operations would be yarded from the site and burned. In precommercial thin areas, some of the cut stems and slash would be added to the forest floor. Any slash that is left on-site would be lopped and scattered to a depth of 18 inches or less. Needles, the most flammable component of the slash, would drop from the branches within three years.

Both ladder fuels and canopy fuels would be reduced by proposed treatments. The treatments would raise the average height of ladder fuels and the density of canopy fuels would be decreased. This would reduce the potential for crown fires in treated stands. As compared to the existing condition, the treatments would create conditions requiring higher wind speeds for a fire to reach the tree crowns, sustain itself, and run in the crowns.

The alternative also includes proposed fuelbreaks where canopy and surface fuels would be reduced. Fuelbreaks would facilitate rapid burnout operations to slow the spread of an approaching wildfire.

Proposed broadcast burn treatments would be conducted so that no more than 10% mortality would occur in trees larger than 9" DBH, and no more than 50% mortality in trees under 9". Sensitive areas identified in the addendum to the Fuels Report would be avoided during unit layout through coordination with the respective specialists.

Fuel treatments would comply with all applicable local and state requirements for air quality.

Alternative 3

Effects on surface fuels would be similar to those identified above for Alternative 2 and would have minimal effect for the first five years following treatment. This alternative would reduce ladder fuels and canopy fuels, although the magnitude of change would be less than under Alternative 2.

Table 3-2 depicts two variables that reflect the effect of proposed treatments on torching and crowning, both of which are indicators of potential fire behavior. As the data reflect, potential for intense fire behavior is highest under the no action alternative, moderate under Alternative 3, and lowest under Alternative 2. Further details are available in the project file.

Table 3-2. Fire Behavior Indicators

Indicator	Alternative 1	Alternative 2	Alternative 3
Average Torching Index (minimum wind speed required to cause individual trees to burn)	20 mph	39 mph	33 mph
Average Crowning Index (minimum wind speed required to cause fire to move through and burn the canopy)	35 mph	53 mph	44 mph

Cumulative Effects

Slash disposal techniques used in previous timber sales (p. 34) consisted of lopping, scattering, piling, and/or burning. Current timber sale provisions require reduction of excess fuels in new sales. Excess fuels outside timber sales have often been left in place due to lack of funding or emphasis, but the National Fire Plan (USDA Forest Service 2001b) focuses on treatment of these natural fuels. Development of private land continues to increase fire hazards and values at risk.

Actions proposed under Alternatives 2 and 3 would increase fire hazard for up to three years in treated areas where fuels are left on the forest floor. Whole-tree yarding, which is proposed in most commercial harvest areas, would eliminate this effect. After needles fall, and in areas where fuels are piled or otherwise reduced, fire hazard would be reduced as compared to the existing condition. These treatments would, to some degree, counteract the cumulative effects of fire suppression in those areas. They would also contribute to the overall Forest-wide goal to reduce hazardous fuel conditions across the Forest.

3.2.2 Soil and Water

This section summarizes the Hydrology and Soils Report, located in the project file, which contains data, research references, and detailed analysis of effects on hydrology and soils. Project design features and mitigation measures discussed on pp. 13-16 are intended to ensure that the project meets Forest Plan direction and applicable laws and regulations.

Channels in the area drain into Spearfish Creek, Whitewood Creek, and Bear Butte Creek. Spearfish Creek joins the Redwater River, which, along with Whitewood and Bear Butte Creeks, flows into the Belle Fourche River.

There are three Hydrologic Unit Code (HUC) 7 watersheds in the project area, as shown in Table 3-3 and Figure 3-1.

Table 3-3. Project Area Watersheds

Name	HUC	Acres in Project Area (NFS)	Acres in Project Area (All Ownerships)	Watershed Acres (Total)	Water Features
Icebox Gulch	10120203030201	1,553	1,963	5,707	Icebox Creek
Middle Whitewood	10120202020101	1,155	2,087	9,239	Whitewood Creek, Woodville Lake
Upper Bear Butte	10120202060101	3,090	5,191	8,793	Bear Butte Creek, Strawberry Creek, Strawberry Lake, Boomer Gulch

The project area also overlaps about 128 acres of the 8,102-acre Annie Creek/Timber Gulch watershed (10120203030202). Annie Creek fully met assigned beneficial uses in the last reporting period (SDDENR 2004). Actions proposed in this watershed consist of 1.6 miles of road reconstruction under Alternative 2 and 1.3 miles under Alternative 3. The reconstruction would take place at the upper edge of the watershed. Reconstruction of NFSR 629.1 would improve the crossing of the upper end of Lost Camp Gulch, which lacks a defined channel at this location and rarely contains water. Because the proposed actions would affect such a small percentage of the watershed (approximately three to four acres, or .04%) and would take place far from surface water in non-sensitive locations, effects of either alternative on this watershed would be negligible.

For the cumulative effects analysis, the entire watershed area will be considered. This area includes a total of about 23,740 acres, including private land.

Beneficial Uses

The State of South Dakota has assigned water quality standards for surface waters. Beneficial uses are defined below.

Class 1: Domestic water supply
Class 2: Coldwater permanent fish life propagation waters
Class 3: Coldwater marginal fish life propagation waters
Class 7: Immersion recreation waters
Class 8: Limited contact recreation waters
Class 9: Fish and wildlife propagation, recreation, and stock watering
Class 10: Irrigation

Beneficial uses associated with perennial and intermittent streams in the project area are shown in Table 3-4.

Table 3-4. Beneficial Uses

Stream	Beneficial Uses
Annie Creek	3, 8, 9, 10
Bear Butte Creek	2, 8, 9, 10
Grizzly Creek	2, 8, 9, 10 (downstream of project area)
Ice Box Gulch Creek	3, 8, 9, 10
Raspberry Gulch	9, 10
Strawberry Creek	3, 8, 9, 10
Sweet Betsey Gulch	9, 10
West Strawberry Creek	2, 8, 9, 10
Whitewood Creek	2, 7, 8, 9, 10
Yellow Creek	3, 8, 9, 10 (downstream of project area)

Intermittent streams and drainages are included in the definition of surface waters of the state, and any intermittent stream segments with assigned beneficial uses will be protected to prevent impairment of those beneficial uses.

Existing watershed conditions

Natural watershed characteristics

The climate in the project area is generally wetter than in most of the Black Hills, with an average of about 29 inches of precipitation per year at Lead (USDA SCS 1979). There is some potential for rain-on-snow events, which may induce peak streamflow, degrade stream channel conditions, and damage road drainage and stream crossing structures.

Water Quality. In comparison to many other Black Hills watersheds, there is a relatively high amount of surface water in the analysis area, especially in the central and eastern areas. Whitewood Creek, Strawberry Creek, and Bear Butte Creek are the main channels with perennial flow in this analysis area. Most other main channels are ephemeral or intermittent drainages. Most tributaries are dry, grassy, and timbered draws that route water only during infrequent and intense run-off events. Most of these draws do not exhibit evidence of recent flow. They contain neither a defined channel nor channel scour exposing gravel or sand substrate.

Past and current assessments show Spearfish Creek generally supports its beneficial uses. All other streams also supported their beneficial uses in the most recent assessment with the exception of Strawberry Creek. Approximately five miles southeast of Deadwood, this stream is a western tributary of upper Bear Butte Creek. In past years, upper Strawberry Creek was severely impacted by mine tailings and by the Gilt Edge Mine. In the last assessment, stream pH maintained acceptable levels but the creek continued to fail to support beneficial uses for total dissolved solids and was impaired for elevated zinc, cadmium, copper, and cyanide concentrations. In July 1999, the mine's owner declared bankruptcy, and the State of South Dakota took over water treatment at the site. On July 31, 2000, the Environmental Protection Agency took over site operations, including water treatment. The new plant became operational in September 2003 and the effluent must meet surface water quality standards except for TDS and selenium (SDDENR 2004).

Soils. Certain soil associations found in the project area (Vanocker-Citadel and Grizzly-Virkula) have moderate to very high erosion potential on slopes over 40%. Both require 70-90% groundcover to control erosion potential. Hisega soils have a very high potential for erosion on

slopes over 40%. There is potential for mass movement where rock layers are parallel to the slope. A small landslide (less than half an acre) occurred several years ago near proposed unit 0821080068 on road 248.1 (T. 4 N., R. 3 E., central section 23).

Forest-wide monitoring of soil compaction indicates that timber harvest and cattle grazing are generally not causing detrimental compaction (USDA Forest Service 2002a). Monitoring also indicates that soils have not been disturbed in excess of the 15% threshold required by Forest Plan standard 1103.

Watershed Condition Class. Watershed classes were assigned to sixth-level watersheds during revision of the Forest Plan (USDA Forest Service 1996 [Appendix J]). Table 3-5 presents watershed condition class information from Appendix J and the corresponding HUC 7 watersheds from above.

Table 3-5. Watershed Condition Class

Sixth-level Watershed Number	HUC 7 Watershed Name	Condition Class
85-01	Spearfish Creek	II
86-01	Whitewood Creek	III
87-01	Bear Butte Creek	III

Watershed Class definitions are from Appendix J:

- Condition Class II – "...are of moderate concern.....[they] may have streams and soils in disequilibrium....Some upland restoration may be necessary."
- Condition Class III – "…are of high concern and must be managed with care." Watershed improvement projects are required.

Channel Morphology. Along much of the perennial section of Bear Butte Creek, US Highway 385 and NFSR 534.1 have influenced channel morphology. Placement of NFSR 534.1 resulted in straightening of some sections of the channel. The former railroad grade occupied by the George S. Mickelson Trail influences morphology of Whitewood Creek. NFSR 170.6 constricts the channel of Strawberry Creek. Roads within the Water Influence Zone of the streams affect channel morphology through floodplain alteration and restriction.

Floodplains. Floodplains within the analysis area are affected by US Highway 385, NFSR 534.1, and private land development. Road placement has resulted in disruption of normal channel migration, disruption of floodplain functions, isolation of portions of floodplains (Bear Butte Creek) and modified area distribution of floodplain waters.

Riparian Ecosystems. Most riparian ecosystems in the analysis area are associated with the perennial drainages of Bear Butte Creek, Whitewood Creek, Strawberry Creek, and West Strawberry Creek. They have also been affected by roads, decreased beaver activity, mining, and other activities. Some spring areas and ephemeral drainage bottoms contain plants associated with riparian areas. However, these areas are separated by open, dry meadows and are not continuous.

Wetlands. The National Wetlands Inventory (NWI) was used to initially delineate wetlands in the Mineral project area. Wetlands in the project area are associated with impoundments, beaver dams, and stream channels. Most wetlands in the project area are on private land. Wetlands on NFS land include approximately five acres of seasonally flooded wetland known as Woodville Lake, and an impoundment that forms a half-acre, semipermanently flooded wetland just off

NFSR 248.1. US Highway 385 and NFSR 534.1 affect wetlands along West Strawberry Creek and Bear Butte Creek, respectively.

Constructed Watershed Features

Roads in the project area were inventoried in 1999 and 2002. As shown in Table 3-6, six road-associated Connected Disturbed Areas (CDAs), high-runoff areas that discharge surface runoff into a stream or lake (USDA Forest Service 2001c), were noted. CDAs may include bare soils, compacted soils, roads, severely burned areas or mine spoils. When water and sediment from a disturbed area flow into a water body without sufficient delay from vegetated filter strips or sediment detention structures, the disturbed area is connected to the water body. CDAs contribute sediment to streams or wetlands, causing degradation of physical function, degraded water quality, and increased peak flows that may alter physical channel processes.

Table 3-6. Connected Disturbed Areas

Road	Location (Watershed)	Drainage	Stream Type	Road Surface	CDA Type/Length
NFSR 227.1	T4N R3E, NE sec. 29 (Whitewood)	Unnamed	Intermittent	Gravel	Erosion around culvert
NFSR 227.1M	T4N R3E, east central sec. 20 (Whitewood)	Unnamed	Intermittent	Grass	Gully at ford/86 ft.
NFSR 248.3	T4N R3E, central sec. 21 (Whitewood)	Unnamed	Ephemeral	Gravel	Gully at ford/25 ft.
NFSR 630.1	T4N R2E, east central sec. 23 (Icebox)	Unnamed	Ephemeral	Native	Sediment plume/20 ft.
US Hwy 85	T4N R2E, central sec. 23 (Icebox)	Unnamed	Ephemeral	Paved	Sediment plume/30 ft.
US Hwy. 85	T4N R2E, east central sec. 23 (Icebox)	Unnamed	Ephemeral	Paved	Sediment plume/40 ft.

There is one water development (fenced spring with tank) and one fence on NFS land in the project area. There are numerous private land fences. Fences concentrate cattle into paths, and areas of bare, compacted earth are found adjacent to several fences.

Direct and Indirect Effects

Soil Erosion, Compaction, Heating, Nutrient Loss, and Mass Movement

Alternative 1 proposes no new activities on erosive or compactable soils. Under the no action alternative, existing soil erosion concerns associated with roads would persist. Ruts, gullies, and areas of standing water would continue to exist. Conditions may worsen without effective closures and decommissioning of damaged, unnecessary roadways. Without new compaction caused by ground-based harvest equipment, and nutrient removal caused by harvest, soil productivity and soil nutrients may improve over time. However, catastrophic fire risk would also increase over time, and soil cohesion, soil productivity, and soil nutrients could be severely impacted in the event of a catastrophic fire event.

The action alternatives propose timber harvest activities, including felling, skidding, decking, transporting of logs off-site, and slash disposal. These actions can affect soil resources. Potential effects on soil resources include soil compaction, displacement, and furrowing. Soil erosion can occur when rainstorms happen on sites where ground cover has been removed.

Loss of soil nutrients is a potential indirect effect of the action alternatives. The majority of soil nutrients are concentrated in the foliage, branches, and the root system of trees. Where whole-tree yarding occurs, some of the nutrients are removed while the rest remain on-site in the roots.

The method of mechanical logging that removes the fewest nutrients is the cut-to-length system where each tree is mechanically processed along the skid trail and only the bole is removed. The cut-to-length harvesting system uses forwarders, which provide full suspension of the logs and minimize soil displacement and cover reduction. Yarding with grapple-skidders provides one-end suspension and the skid trail is swept by the dragged tops, sometimes displacing soil and uprooting vegetation. Tractors yarding with cables may not have the logs suspended at all, and can lead to more furrowing and displacement than grapple skidders.

Based on Forest-wide and site-specific monitoring of harvest units, proposed harvest activities would not cause detrimental soil disturbance in excess of the 15% threshold set by Forest Plan standard 1103.

Vegetation treatments and road management are proposed on soils with unstable/erosive characteristics. Under Alternative 2, these activities are proposed on approximately 76 acres of unstable/erosive soils. Under Alternative 3, activities would take place on 59 acres of these soils. Areas of these soils in proposed treatment sites are small inclusions ranging from less than one to three acres in size. Stipulations that larger areas and those on especially steep slopes would be excluded from ground-disturbing activities would result in negligible effects on the soil resource (see p. 13).

Sites where activities might contribute to erosion would be stabilized and maintained with erosion control measures in accordance with Forest Plan standards, BMPs, and Watershed Conservation Practices (USDA Forest Service 2001c). Forest Service Handbook 2509.25, Watershed Conservation Practices Handbook, Chapter 10, Standard (9)e directs the Forest Service to "Avoid new roads or heavy equipment use on unstable or highly erodible soils." Treatments proposed on steep, potentially erosive soils or on steep soils with potential for mass movement are listed by stand in the Hydrology and Soils Report in the project file.

No road construction is proposed on steep, erosive soils or on steep soils with potential for mass movement.

While some small-scale ground disturbance may occur during road decommissioning, decommissioned roads would generally no longer produce noticeable sediment once the road surface has revegetated. Successfully decommissioned roads would result in a long-term beneficial effect.

Treatments are also proposed on steep soils with some potential for mass movement. Affected areas and acreages are the same as those shown above for unstable/erosive soils, with the addition of another 20 acres under Alternative 2 and 21 acres under Alternative 3. Stand-by-stand listings are included in the Hydrology and Soils Report. As discussed above, areas of these soils in proposed treatment sites are small inclusions ranging from less than one to three acres in size. Design criteria listed starting on page 13 would reduce effects on these soils and on general soil productivity and soil nutrients to negligible levels. Slash or vegetation would be retained on all land units, aiding the conservation of site moisture.

Streamflow Regime

Changes in water yield can be discussed in terms of annual or peak flow increases. Because the greatest risk to channel degradation occurs during high flow periods, the increase in magnitude and duration of peakflows is of greatest concern.

Since there are no activities associated with the no action alternative, water flow volumes would in the short term continue to depend on precipitation variability. Existing vegetation structures would persist until future management or the next fire, beetle infestation, or other natural event. Until that time, vegetation growth may slightly diminish water yield.

Since there would be no decommissioning of existing roads or rehabilitation of CDAs, the current road system would continue to support increased water yield and delivery from roadways. The drainage network extension caused by the current road system would also persist. Peak flows would remain at a higher level than they would be without a road network on the landscape, and the timing of those flows would continue to be accelerated. All of the road/stream crossings in the analysis area, including the CDAs on NFSRs 227.1, 630.1, and 248.3, would remain unimproved.

Under the action alternatives, increases in flow volume resulting from timber harvest and vegetation management may occur. Regeneration and accelerated growth of remaining vegetation are likely to balance the water equation over time. Runoff is unlikely to increase above current levels under either action alternative.

None of the proposed new road construction would add CDAs. Under both action alternatives, decommissioning of the part of 227.1M beyond the proposed cutting unit (Figure 2-4) would remove the associated CDA. Reconstruction of 630.1 and 248.3 would eliminate CDAs from these roads. Disconnecting these sediment sources from the drainage network would contribute to improvement of overall watershed conditions. In addition, proposed decommissioning of unneeded non-system roads would eliminate the roads' contribution to higher runoff volumes and accelerated water delivery.

Water Quality

Under Alternative 1, existing roads would continue to contribute sediment to the drainage network where CDAs exist. Since no new roads or skid trails would be built, there would be no new potential sources of sediment. The current conditions of temperature, dissolved oxygen, and water purity would generally persist in surface water locations.

Because the action alternatives would be implemented using BMPs and other design criteria, water quality and beneficial uses in the project area would not be negatively affected by proposed activities. Streams, springs, and some ephemeral draws would be buffered from activities with streamside management zones and vegetation buffers. Disturbed sites would be reseeded to prevent harmful runoff and sedimentation. CDA rehabilitation on NFSRs 227.1M, 248.3, and 630.1 could result in short-term sediment increases in the drainage network but long-term decreases. Stream crossing improvement activities could also generate short-term increases in sediment and long-term decreases.

Channel Morphology

Since there are no new activities associated with the no action alternative, there would be no new effects on stream morphology. Stream channels that are currently unstable would continue to gradually stabilize over the next several decades. Existing roads and road/stream crossings that affect channel morphology would continue to do so. Stream channels may still be adjusting to the increased water yield, sediment loads, elevated peak flows, and accelerated peak flow timing caused by the current road system.

Small increases in flow volume may occur under the action alternatives, but subsequent changes in stream morphology are not expected to result from proposed burning and timber harvest. Proposed activities are not expected to substantially change stream channel dynamics. Decommissioning of non-system roads and CDA rehabilitation on NFSRs 227.1M, 248.3, and 630.1 would reduce the higher runoff volumes and accelerated water delivery caused by the road network. These reductions would result in a more stable flow regime and reduced risk of significant channel readjustment following flood events.

Floodplains

Alternative 1 would cause no new effects on floodplains. Roads currently affecting floodplains would continue to do so.

Neither action alternative proposes activities in floodplains. Most roads located in floodplains are federal or state highways or on private land and would be unchanged by this project.

Riparian Ecosystems

Alternative 1 would cause no new impacts to riparian ecosystems. Existing impacts resulting from roads would persist.

Under the action alternatives, designation of protected streamcourses and employment of appropriate design criteria would prevent noticeable impacts from harvest activities. No new roads would be built in riparian ecosystems. Road storage and associated riparian restoration activities may result in short-term impacts to riparian ecosystems such as vegetation alteration or sediment production. However, long-term benefits of enhanced riparian conditions are expected to result from these actions.

Wetlands

Alternative 1 would have no new effects on wetlands in the project area.

Under Alternative 2, commercial and precommercial thinning would take place adjacent to the Woodville Lake wetlands (Township 4 North, Range 3 East, section 21). Overstory removal would occur near the impoundment-related wetland on NFSR 248.1A (Township 4 North, Range 3 East, section 24). The integrity of these wetlands would be protected using BMPs and site-specific design criteria (p. 13).

NFSR 248.1A would be gated and seeded following use. An unclassified road that extends 248.1A upstream of the wetland would be decommissioned. These actions would have a positive effect on the wetland through reduction of disturbance and sediment production.

Under Alternative 3, no vegetation treatments would occur adjacent to wetlands. Road closure and decommissioning identified above would take place. This alternative would maintain or improve wetland conditions.

Cumulative Effects

No Action Alternative

No new harvest, road, and fuel treatment activities would occur on NFS lands under the no action alternative. Planned post-sale activities associated with the Boomer timber sale would continue. No roads would be decommissioned. CDAs in the area would not be rehabilitated.

Action Alternatives

Soils and Mass Movement
Past, current, and foreseeable timber/fuels management activities have occurred or will occur on about 11% to 21% of each watershed (Table 3-7). Previously treated timber sale units are well vegetated, however, and currently show little sign of soil disturbance or compaction. Some activities on non-NFS lands have disturbed or compacted soil, but available evidence indicates revegetation in most areas (e.g., around newly constructed residences and recreational developments) with a few lingering effects from features such as new roads, road cuts, and steep sections of motorized trails. The Gilt Edge Mine, which covers approximately 1% of the Upper Bear Butte watershed, remains unvegetated, but is being managed by the Environmental Protection Agency to mitigate effects on water quality (SDDENR 2004).

Overall, the current condition of the cumulative effects area appears to be one of minor (less than 15%) soil disturbance. Actions proposed under Alternative 2 would increase the area on which vegetation treatments and road work have taken place to approximately 14% to 35% depending on watershed. Alternative 3 would increase the area to 12% to 32%. About a third of Upper Bear Butte and Icebox Gulch watersheds would have been treated under these alternatives. As stated above, areas treated in the past show few signs of soil disturbance or compaction. Proposed activities would be scattered across the watersheds and occur over five to ten years; therefore, they would be well distributed both spatially and temporally. Given the distribution of proposed activities and typically rapid revegetation (USDA Forest Service 1996), neither action alternative would cause soil disturbance that is cumulatively detrimental or exceeds 15% of the land unit.

Table 3-7. Cumulative Watershed Area Treated

	Upper Bear Butte	Icebox Gulch	Middle Whitewood
Percent of watershed affected by past, current, and foreseeable actions	21	13	11
Percent of watershed affected by past, current, foreseeable, and planned actions (Alternative 2)	35	32	14
Percent of watershed affected by past, current, foreseeable, and planned actions (Alternative 3)	27	32	12

Very little clearcutting has taken place in the cumulative effects area and none is proposed, indicating minimal chance of harvest-related mass movement events.

Roads would be constructed, maintained, reconstructed, stored, or decommissioned, resulting in short-term effects to soils. Bare earth would be exposed after such activities until revegetation has occurred. Harvest activities usually occur after reworked roads have stabilized. Cumulative effects from these activities are not of measurable scale. Long-term beneficial watershed effects are expected from maintenance and decommissioning of roads. These beneficial effects include stabilization of exposed soil and revegetation of disturbed land. Stabilized and maintained roads are at lower risk of mass movement.

Prescribed burning disturbances to soils and the watershed typically do not persist for more than one season. Revegetation and freeze/thaw cycles break up small areas of bare earth or hydrophobic soils created by prescribed burning. Vehicles that conduct mechanical fuel treatments usually drive over the slash they create, causing little soil disturbance.

Livestock grazing will continue on NFS and private lands in parts of the cumulative effects area. Most grazing occurs in grassy valley bottoms, whereas timber harvest and fuel treatment occur on forested uplands. The proposed actions may positively influence cumulative effects of livestock grazing by increasing upland forage, which may reduce grazing pressure on valley bottoms.

Off-road motorized vehicle traffic contributes to the level of disturbance in the area. Traffic of this type can increase the amount of bare, displaced soil and exposes soil to erosive weather conditions. During field exams, signs of off-road use were apparent in some areas. Areas of exposed soil appear to be localized, and the level of this disturbance combined with all other disturbance sources remains below the 15% threshold for land units in the analysis area.

Streamflows, Water Quality, and Channel Morphology

Streamflows, water quality, and channel morphology have seen few changes over the last planning cycle, other than improvement of water quality in Strawberry and West Strawberry Creeks. Vegetation treatments conducted in accordance with BMPs do not result in unacceptable watershed effects (USDA Forest Service 2002a). Planned harvest and fuel reduction activities are on a scale comparable to recent vegetation management activities. Past vegetation management has not caused unacceptable water quality violations or impairments of beneficial uses. Because proposed activities would take place over time and across a wide area, would be conducted in accordance with BMPs, and are not expected to result in persistent or severe negative direct or indirect effects, Alternative 2 would have negligable cumulative effects on streamflows, water quality, and channel morphology. Alternative 3 would affect less of the area and have comparatively less effect on these resource areas.

Roads and the road network have affected water flows in the analysis area. New road construction and road decommissioning conducted using standard BMPs would not cause measurable cumulative effects on streamflow, water quality, or channel morphology.

Grazing, off-road vehicle use, and private land development may have cumulative effects with planned vegetation and road treatments if their scale increases in the near future. However, planned treatments would be such a small fraction of this cumulative effect that their independent contributions would not be measurable.

Floodplains, Wetlands, and Riparian Ecosystems
Vegetation treatments, roadwork, grazing, and off-road vehicle use would all occur under the action alternatives. Other than unmanaged off-road vehicle use, all activities on National Forest System lands would be conducted using appropriate BMPs and would not lead to unacceptable cumulative impacts on floodplains, wetlands, and riparian ecosystems. Should off-road vehicle use increase, these areas may realize increased cumulative effects.

3.2.3 Transportation System

There are approximately 50.8 miles of roads on NFS lands in the project area, including 3.8 miles of state and federal highways, 1.0 miles of county road, 30.6 miles of NSFRs, and 15.4 miles of unclassified roads. Unclassified roads are generally unplanned roads that are not part of the Forest Service maintained road system. Approximately 8.3 miles of NFSRs and 6.6 miles of unclassified roads are closed year-round. There are approximately 4.08 miles of open road per square mile of land, well above the desired average (USDA Forest Service 1997a).

There are approximately 7.0 miles of snowmobile trail in the project area. The trails are located both on classified and unclassified roads.

Direct and Indirect Effects

Both action alternatives include closure of roads that are currently open year-round and decommissioning of existing roads. Most unclassified roads would be decommissioned. Roads that double as snowmobile trails would remain open to snowmobile use. Mileages resulting from these proposals are reflected in Table 3-8.

Table 3-8. Transportation System Effects

	Alt. 1	Alt. 2	Alt. 3

Miles of road on NFS open year-round	35.9	24.4	25.2
Miles of road on NFS open seasonally	0	0	0
Miles of road on NFS closed year-round	14.9	19.0	16.8
Miles of road on NFS currently open that would be decommissioned	0	10.5	10.1
Miles of open road per square mile of NFS	4.08	2.77	2.86

Adequate access to the forest for public use and administrative purposes would remain under any alternative.

Cumulative Effects

The cumulative effects analysis area for the transportation system includes all ownerships in the project area. There are about 190 miles of road on all ownerships in the cumulative effects area. Many of the roads are on private land. Assuming roads on private land are used by motorized vehicles, there are approximately 144 miles of road open to motorized vehicles. Many of the roads were created through mineral exploration, settlement access, and, more recently, recreational driving. These actions have combined to result in 5.1 miles of open road per square mile of land in the cumulative effects analysis area. This facilitates management of the forest and access in case of fire but decreases areas available for unroaded recreation experiences and negatively affects habitat for some wildlife. Because of topographic constraints, there are still areas without adequate access to harvest timber. Overall, both action alternatives would close roads that are open year-long, reducing the miles of road per square mile to approximately 4.2 miles per square mile. The incremental effect of either action alternative would provide site-specific benefits to non-motorized recreation and wildlife habitat effectiveness, but would have little effect on the cumulative effects of previous, current, and foreseeable transportation management in the project area.

3.3 Biological Consequences

3.3.1 Forest Vegetation

This section summarizes the Forest Vegetation report, located in the project file, which contains data, research references, and detailed analysis of effects on forest vegetation. Further information is also available in the rangeland and noxious weeds sections of this document. Project design features discussed on pp. 13-16 and 23 are intended to ensure that the project meets Forest Plan direction.

Affected Environment

Stand Diversity

Dominant vegetation on approximately 93% of the National Forest System land in the project area is ponderosa pine, 3% hardwoods (aspen or birch), 3% spruce, and 1% grasses and forbs in upland or riparian meadows. The remainder is rock or other non-vegetated land.

Forest Plan direction for the BHNF and Management Area 5.1 generally aims for a balance of forest conditions. That balance includes various tree species, vertical layers, and age-classes, either between forest stands or within them (Forest Plan objectives 204, 206, 208, 209, and 5.1-202, and standards 2101, 2102, 2103, and 2202), as well as maintenance or restoration of certain cover types, such as aspen, birch, and meadows, where these have declined due to fire protection and pine encroachment (Forest Plan objectives 201, 205, and 5.1-203, and standard 2107).

Any treatment that reduces stand density increases the risk of trees being blown down by strong winds, especially when combined with heavy snow. Under both action alternatives, some of the proposed shelterwood seed cuts and commercial thins would decrease basal area in treated stands substantially. These stands would be at increased risk of blowdown until root systems strengthen.

Direct and Indirect Effects

No Action Alternative

If no action were taken, vegetative cover types and structural stages would initially remain unchanged unless modified by processes such as wildfire, conifer encroachment into meadows and hardwoods, increasing stand densities, and mountain pine beetle infestation. Any of these events would contribute to structural stage changes and/or modification of vegetative cover type.

Mountain pine beetle infestation appears to be continuing to spread in the project area. The degree of impact cannot be reliably predicted. However, it is known that the project area contains approximately 960 acres of highly susceptible stands. Based on experience with outbreaks in other parts of the Black Hills, it is reasonable to predict that in these stands at least 25% of all large pines will be killed if infestation takes place (McCambridge et al. 1982). It would not be unusual for average mortality to exceed 50%, with near-total mortality in patches or some whole stands.

Alternative 2

Alternative 2 would reduce acreage of dense, mature pine (structural stages 3C and 4C) by 44% while increasing moderately dense, mature pine (structural stage 4B) by 61% and open, mature pine (structural stage 4A) by 2%. The overall near-future condition would be a more open forest environment that favors development of large pine trees except where new stands are released by overstory removal.

The proposed action includes about 1,542 acres of silvicultural treatments in timber stands currently at risk of mountain pine beetle damage. These treatments, including commercial thinning (1,350 acres) and shelterwood seedcutting (193 acres), would reduce stocking density and retain the most vigorous large trees.

Alternative 3

Alternative 3 would reduce acreage of dense, mature pine (3C and 4C) by 31% while increasing moderately dense, mature pine (4B) by 32%. Compared to the proposed action, this alternative results in slightly more acres remaining in each density class of mature pines, because Alternative 3 would retain more large trees overall.

The future condition under Alternative 3 would be a less open forest than under Alternative 2, unless beetle-caused mortality becomes more widespread. More large trees would remain, particularly in stands proposed for overstory removal under Alternative 2. In some areas, new age-classes of pine seedlings would be initiated among the retained large trees but less so than under Alternative 2.

This alternative would treat about 1,340 acres of timber stands currently at risk of mountain pine beetle infestation by reducing stocking density and retaining the most vigorous large trees. Treatments that would reduce insect risk include all commercial thinnings (592 acres), some of the shelterwood seedcut treatments (427 acres), and much of the hardwood enhancement area (321 acres). This alternative would treat 202 fewer acres at high risk of infestation than would Alternative 2.

Insects and Disease

A 2004 aerial survey found approximately 1,470 acres in the project area with at least one tree per acre infested with mountain pine beetle (USDA Forest Service 2004). An approximately 40-acre area of near-complete pine mortality west of Strawberry Lake is visible from US Highway 385. Another area of heavy infestation is the vicinity of NFSR 170.7 (Gilt Edge road) east of US 385. Many trees in these areas are already dead and too deteriorated to salvage. Nearby dense and moderately dense stands are likely to become infested.

Forest Plan objective 228 directs maintenance or reduction of ponderosa pine acres at medium or high risk for mountain pine beetle infestation. Pine beetle outbreaks are known to start in, and expand from, densely stocked stands or patches of larger-diameter pines. Generally, stands are considered most susceptible when 75% of the trees are in the 7-13" diameter range and density is over 120 square feet of basal area per acre (Stevens et al. 1980, Schmid and Mata 1992). Table 3-9 displays risk ratings for each alternative immediately following harvest and in 2025.

Table 3-9. Mountain Pine Beetle Risk

Risk Class*	Alt. 1		Alt. 2		Alt. 3	
	Existing	2025	Following treatment	2025	Following treatment	2025
Low	2,379	952	3,811	2,287	3,351	2,011
Moderate	914	1,463	441	1,524	608	1,340
High	1,881	2,795	922	1,363	1,215	1,823

Approximately 1,881 acres (36% of the pine acres) are at high risk of infestation, and 914 acres (18%) are at moderate risk. If no action is taken, area at high risk is projected to increase to 2,795 acres (54%) by 2025, while medium risk would increase to 1,463 acres (28%).

Both action alternatives would reduce beetle infestation risk in treated stands. This effect would continue to be felt in the future, as displayed in the table above. High-risk stands would decrease to 18% of the pine acres under Alternative 2 and 23% under Alternative 3. The largest reduction in acres at medium/ high risk both immediately after harvest and in 2025 would be under Alternative 2.

Cumulative Effects

Since the late 1980s, timber management actions have occurred on approximately 2,529 acres in the cumulative effects analysis area (19% of NFS acres), including 1,565 acres in the project area. Sales include Boomer, Butte, Dano, Hanna, Park, Strawberry, and Woodville (p. 34). Under Alternative 2, the cumulative area treated would increase to 29% of NFS lands in the cumulative effects area. This figure takes into account some of the proposed treatments occurring on the same ground as previous timber sale units. Under Alternative 3, 27% of the cumulative area would be treated. Timber management actions are designed to provide a variety of stand densities, age and size classes, and vertical layers in a forest that would otherwise be very homogeneous. These design features, combined with the selective nature of the harvest associated with the previous or ongoing sales, would ensure that there are no adverse cumulative effects on forest vegetation resources.

The continuous nature of the forest cover can allow crown fires to run for long distances under certain weather conditions. In the long term, the no action alternative would add to this effect by allowing forest cover to expand. Heavy fuel loading from insect infestations would remain a fire hazard. Alternatives 2 and 3 would counteract this effect by varying stand structure, decreasing ladder fuels, and creating fuel breaks.

Cumulative effects on mountain pine beetle activity are not well understood. Little is known about pre-settlement beetle outbreaks (Parrish et al. 1996). The action alternatives are designed to reduce the risk of mountain pine beetle infestation and may reduce the risk of spread. Beetle outbreaks are likely to continue to occur periodically at some scale under all alternatives.

3.3.2 Wildlife Habitat

This section summarizes the Wildlife Biological Assessment/ Biological Evaluation and Biologist's Report, located in the project file, which contain data, research references, and detailed analysis of effects on wildlife resources. Project design features and mitigation measures discussed on pp. 13-16 and 23 are intended to ensure that the project meets Forest Plan direction.

Habitat Components

Existing forest structure is generally dominated by stands of mature pine at low to moderate density. Very dense stands of mature trees are less common. Pure stands of young trees are unusual, but most of the open stands have an understory of pine seedlings and saplings. The following tables display predicted habitat structure distribution by cover type after treatment. Table 3-13 compares structural stage and cover type changes by alternative.

Habitat structural stage (SS) is described as follows:

SS 1: Grasses and forbs
SS 2: Seedlings and saplings
SS 3A: Young, open forest
SS 3B: Young, moderately dense forest
SS 3C: Young, dense forest
SS 4A: Mature, open forest
SS 4B: Mature, moderately dense forest
SS 4C: Mature, dense forest
SS 5: Late succession ("old growth")

Table 3-10. Structural Stage Distribution by Cover Type - Existing

Cover Type	Habitat Structural Stage (acres)									
	SS 1	SS 2	SS 3A	SS 3B	SS 3C	SS 4A	SS 4B	SS 4C	SS 5	Totals
Meadow	58	0	8	0	0	63	0	0	0	129
Aspen	37	14	0	0	0	83	15	0	0	149
Pine	155	348	73	46	191	1,680	1,226	1,615	0	5,334
Spruce	0	19	0	0	0	165	0	2	0	186
Totals	250	381	81	46	191	1,991	1,241	1,617	0	5,798

Table 3-11. Structural Stage Distribution by Cover Type - Alternative 2

Cover Type	Habitat Structural Stage (acres)									
	SS 1	SS 2	SS 3A	SS 3B	SS 3C	SS 4A	SS 4B	SS 4C	SS 5	Totals
Meadow	129	0	0	0	0	0	0	0	0	129
Aspen	37	14	0	0	0	83	15	0	0	149
Pine	155	408	67	97	138	1,715	1,876	878	0	5,334
Spruce	0	19	0	0	0	165	0	2	0	186
Totals	250	441	75	97	138	2,026	1,891	880	0	5,798

Table 3-12. Structural Stage Distribution by Cover Type - Alternative 3

Cover Type	Habitat Structural Stage (acres)									
	SS 1	SS 2	SS 3A	SS 3B	SS 3C	SS 4A	SS 4B	SS 4C	SS 5	Totals
Meadow	129	0	0	0	0	0	0	0	0	129
Aspen	37	14	0	0	0	120	110	0	0	281
Pine	155	408	67	75	160	1,678	1,566	1,093	0	5,202
Spruce	0	19	0	0	0	165	0	2	0	186
Totals	250	441	75	75	160	1,963	1,676	1,095	0	5,798

Table 3-13. Percent Change in Structural Stage and Cover Type

SS	Aspen		Meadow		Ponderosa Pine		White Spruce	
	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3
1			+122%	+122%				
2					+17%	+17%		
3A					-8%	-8%		
3B					+111%	+63%		
3C					-28%	-7%		
4A		+45%			+2%	-.1%		
4B		+630%			+53%	+28%		
4C					-48%	-32%		

Vegetation Diversity

The project area is characterized by ponderosa pine cover type. Approximately 92% of the National Forest System land is in pine, with 3% in hardwoods, 3% in spruce, and 2% in dry or riparian meadows. The remainder is rock or other nonvegetated land. Dominance of ponderosa pine is a natural condition in the Black Hills, but pine is probably more dominant now than it was historically (Parrish et al. 1996). Though other plant communities are in limited supply, they provide vital habitat components for many wildlife species. More stand diversity data are available in the silviculture specialist's report in the project file.

Effects on Meadows and Open Habitat

Meadows are shown in the above tables as separate from forest structural stage 1 because the two designations are not synonymous. Meadows are natural openings and usually exist on soils formed under grass. Conversely, structural stage 1 in forest stands is the first step in forest succession and occurs as forest openings such as clearcuts or patches of timber killed by mountain pine beetles. Meadows generally produce more forage than grass/forb structural stage and often contain different plant composition.

Most of the meadows in the project area are in private ownership. National Forest System lands include 129 acres of grassland or meadow, some of which has become forested over time. Both action alternatives propose meadow maintenance on 79 acres of meadow currently in structural stage 3A or 4A. This treatment would restore meadow habitat in the treated stands.

Effects on Hardwood Habitat

Aspen and birch are important components of Black Hills habitat diversity. Deer and elk browse both species, while ruffed grouse and various songbirds use hardwood habitat for feeding and nesting. Young aspen stands are also very important deer fawning habitat (Kennedy 1992).

Conifers are encroaching many of the hardwood sites. Left untreated, these conifers will eventually overtake the hardwoods. The no action alternative would result in an eventual decrease of hardwood acres.

Alternative 2 includes commercial thinning ponderosa pine in stands that include aspen clones. All merchantable timber would be harvested within the clones and within 66 feet of the clone boundary. These acres are not reflected in Table 3-11 because the aspen inclusions are not considered separate stands. Alternative 3 includes hardwood maintenance treatments, which would remove merchantable timber encroaching in aspen inclusions as well as removing pine within 120 feet of aspen clones. These acres are reflected in Table 3-12 because the aspen inclusions would increase in size and become separate stands. Alternatives 2 and 3 are expected to maintain or enhance hardwoods on the landscape in the long term.

Effects on Open Mature Conifer Habitat

Open mature conifer stands (structural stage 4A) currently comprise 32% of the ponderosa pine cover type. While the average diameters are relatively small (9-13") these stands still represent potential suitable habitat for several species, including pygmy nuthatch, Lewis' woodpecker, deer, elk, and several raptors.

Both action alternatives would increase acreage of open mature ponderosa pine. As stands are thinned, diameter, tree height, and crown growth would accelerate, thereby moving these stands toward conditions more suitable for species requiring large-diameter, open-grown ponderosa pine.

Effects on Dense Conifer Habitat and Late Succession

Dense mature conifer stands (SS 4C) exist on about 28% of the project area. The no action alternative would retain all dense stands. Alternatives 2 and 3 would decrease acreage of dense stands by 46% and 32%, respectively. While stand density would decrease, risk of complete loss of these stands to beetle infestation would also decline.

The project area does not contain any areas designated as Management Area 3.7 (late succession forest landscapes). Late succession (structural stage 5) stands are also absent from the Mineral landscape. Thinning treatments proposed in Alternatives 2 and 3 would accelerate development of large diameter trees on the landscape, while development of large trees under the no action alternative is expected to be considerably slower. Modified commercial thin/prescribed burn prescriptions on 254 acres (Alternative 2) and 193 acres (Alternative 3) would result in management of a contiguous 349-acre block of stands for development of late-succession characteristics.

Effects on White Spruce Habitat

White spruce stands in the project area would remain unchanged after implementation of Alternatives 2 and 3. Scattered young spruce have begun to grow on the upper portions of south and west slopes in pine stands, mainly due to fire suppression. Both action alternatives could remove young spruce in such stands. Removal of spruce in these stands is not expected to influence spruce-dependent wildlife due to the small-diameter and scattered nature of encroaching spruce trees.

Alternatives 2 and 3 also propose removal of encroaching conifers from meadows and hardwood stands. Some encroachment includes scattered young spruce that, if removed, is not expected to impact spruce-dependent wildlife.

Effects on Snag Habitat

Snags (dead standing trees) are an important habitat component for many species. Primary cavity nesters such as the black-backed woodpecker excavate their own cavities in dead trees that have rotting heartwood. Secondary cavity nesters such as the white-breasted nuthatch use natural cavities or abandoned woodpecker cavities. Specific direction was set in the Forest Plan to maintain habitat for cavity nesters. Discussions relating to sensitive cavity nesters are found in the Forest Plan FEIS, Appendix H.

As discussed on p. 52, mountain pine beetle infestation is common in the project area. Most pines have been killed in scattered areas up to 40 acres in size, and there are many smaller pockets of beetle kill. The infestation continues to spread, creating numerous snags of various diameters.

No Action Alternative

The no action alternative would have no effect on existing snags and would leave all existing live trees in place as potential future snag habitat. It would have no immediate effect on dense stands, which are habitat for sensitive species such as American three-toed woodpecker and black-backed woodpecker. The latter reaches greatest abundance where infestations of insects occur across a wide area. The no action alternative would allow additional habitat for this species to develop at a rate greater than the other alternatives, as the existing beetle infestation is likely to continue to expand most quickly under this alternative. In addition, the continued development or stagnation of dense stands would increase risk of insect infestation.

Snags in open-canopy stands are habitat for species such as Lewis' woodpecker and northern flicker. This habitat could diminish over time as open stands regenerate.

Snag recruitment rates are likely to be greatest under the no action alternative in the short-term due to the ongoing beetle infestation.

Alternatives 2 and 3

Under the action alternatives, snags that pose a safety hazard during logging operations would be cut and retained on site, where they would add to the down woody component. All other existing snags would be left standing.

Both alternatives would thin a portion of the project area's dense stands. Thinning would decrease acres of suitable habitat for species associated with dense stands and may decrease short-term snag recruitment since the residual trees would be less likely to succumb to insects, diseases, or natural mortality. Conversely, trees in thinned stands may grow larger and live longer due to improved growing conditions, resulting in larger-diameter snags in the future. In addition, thinning proposed in this project is designed to retain the largest trees and remove smaller trees competing for resources, whereas mountain pine beetles are likely to infest any mature tree in a dense stand.

The Forest Plan requires retention of sufficient large green trees to provide future large-diameter snags (standard 2302, guideline 2306[1]). Other diameter classes must also be represented across the watershed to provide snags of other sizes and further in the future.

[1] To be treated as a standard under the Phase 1 Amendment.

Harvest treatments in pine stands would affect the number and distribution of large green trees. Treatments that leave few overstory trees are most likely to have an effect. This includes overstory removal cuts, proposed only under Alternative 2. To comply with Forest Plan standard 2302, overstory removal treatments have been designed to retain approximately five square feet of basal area per acre (an average of about 110 feet between trees 16" DBH or 140 feet between trees 20" DBH).

Prescribed fire treatments are designed to minimize the loss of existing snags during treatment and also would avoid overstory mortality and the creation of snags. Consequently, the effect of prescribed burning on snags is considered minor.

The Black Hills Phase I Snag Model (USDA Forest Service 2002b) was used to generate the results in Table 3-14. As the table indicates, both action alternatives would meet Forest Plan direction for green-tree retention across the project area. The table displays green tree density projected out to 2025 for each alternative. Other diameter classes would also be represented across the watersheds to provide snags of various sizes and large snags in the future. When compared to the no action alternative, both action alternatives would increase the number of green trees with diameters of at least 20" post-treatment and in the future.

Table 3-14. Green Tree Retention on Pine Sites

7th Order Watershed	Alt. & Year	Aspect	Live Pine per Acre by 2" DBH Class					
			10-12"	12-14"	14-16"	16-18"	18-20"	>20"
10120202020101 (Middle Whitewood)	Existing	North	7.66	11.21	5.41	2.28	2.62	1.46
		South	17.51	26.27	7.11	5.73	3.21	2.1
	Alt. 1: 2025	North	6.26	11.3	8.1	2.65	2.76	1.81
		South	20.23	22.12	11.97	6.82	4.12	4.08
	Alt. 2: 2025	North	5.7	10.59	6.07	2.68	2.39	2.06
		South	18.97	17.98	11.29	7.14	4.15	4.08
	Alt. 3: 2025	North	7.44	9.45	4.89	1.76	1.78	1.85
		South	18.97	17.98	11.29	7.14	4.15	4.08
10120203030201 (Icebox Gulch)	Existing	North	21.25	2.99	4.89	0.89	0.55	0.44
		South	12.45	2.84	3.46	0.7	0.55	0.45
	Alt. 1: 2025	North	22.15	10.62	7.09	1.8	3.28	2.48
		South	24.14	12.24	8.16	3.39	4.17	2.2
	Alt. 2: 2025	North	9.41	3.18	7.77	6.54	6.95	3.42
		South	10.64	12.24	7.16	2.71	4.85	2.2
	Alt. 3: 2025	North	9.41	3.18	7.77	6.54	6.95	3.45
		South	10.64	12.24	7.16	2.71	4.85	2.2
10120203060101 (Upper Bear Butte)	Existing	North	11.07	8.36	7.23	5.24	2.47	2.08
		South	16.25	11.28	7.17	5.58	2.47	1.69
	Alt. 1: 2025	North	11.18	10.14	0.32	0.11	3.93	3.42
		South	18.43	10.75	9.76	5.61	4.25	4.14
	Alt. 2: 2025	North	10.92	10.16	0.77	0.57	4.18	3.42
		South	15.13	8.86	8.18	8.81	4.24	4.37
	Alt. 3: 2025	North	10.97	10.14	0.54	0.21	4.1	3.37
		South	15.13	8.81	6.97	4.19	3.38	4.34

Mountain pine beetle infestation is expected to create more snags across the landscape, primarily in 4B and 4C stands. Storm events have also created snags by breaking tops out of trees, but there have been no instances of widespread weather-caused tree mortality in the project area.

Cumulative Effects
The number of snags in the project area was probably reduced by previous timber harvesting and firewood sales. Due to the current prohibition on cutting of standing snags unless they represent a safety hazard, the alternatives would add very little to this cumulative effect. Moreover, the ongoing beetle infestation has greatly increased snag numbers and will continue to do so under any alternative. Treatments designed to slow the spread of the infestation would slow the rate of snag creation, but would increase the chances of live trees surviving to provide future large-diameter snags. The incremental change in cumulative effects under any alternative would be negligible.

Effects on Down Woody Material
Availability of large down wood varies across the project area. Although large landing piles may be used for firewood, smaller piles and scattered logs remain to provide habitat for small mammals. Beetle-killed trees will continue to provide large amounts of down woody material in infested areas. The no action alternative would have the greatest recruitment potential since all available trees could become down woody material. To ensure that proposed treatment areas do not lack large, down wood, cull logs greater than 10" DBH would be left on site or returned to the site in all stands not requiring whole tree skidding. This design feature ensures that guideline 2307[2] would be met.

Threatened, Endangered, Proposed, and Sensitive Species

The U.S. Fish and Wildlife Service provided a list of federally threatened, endangered, and proposed species via the USFWS South Dakota Field Office internet site. The bald eagle and black-footed ferret are the only threatened, endangered, or proposed species with potential to occur in the Black Hills. No critical habitat has been designated for any species on the Black Hills National Forest.

Species on the most recent sensitive species list (FSM R-2 Supplement 2600-2003-1) that may occur on or near the Black Hills were considered in this analysis. Some of the sensitive species as well as the bald eagle are also designated as Management Indicator Species (MIS) by the Forest Plan.

Table 3-15 displays these species occurring on the Black Hills National Forest.

[2] To be treated as a standard under the Phase 1 Amendment.

Table 3-15. Threatened, Endangered, Proposed, and Sensitive Wildlife and Fish Species Found on BHNF

Species	Status *	Species Present **	Habitat Present ***	Habitat Description
Bald eagle (*Haliaeetus leucocephalus*)	T, MIS	X	X	Usually found near open water or carrion in winter (Tallman et al. 2002). No nests or traditional roosts known in project area.
Black-footed ferret (*Mustela nigripes*)	E			Large prairie dog towns (FWS WWW 2003)
Fringed Myotis (*Myotis thysanodes*)	S, MIS		X	Forages on insects in a variety of habitats including grasslands and forested areas. Roosts in a variety of structures including caves, mines, tunnels, and buildings (Schmidt 2003b).
Townsend's big-eared bat (*Plecotus townsendii*)	S, MIS		X	Forages on insects in a variety of habitats including forested and wet areas. Roosts in a variety of structures including caves, mines, and buildings (Schmidt 2003a).
Black-tailed prairie dog (*Cynomys ludovicianus*)	S			Short-grass and mixed-grass prairies (FWS WWW 2003).
American marten (*Martes americana*)	S, MIS	X	X	Spruce forests with complex near-ground structure, extending into adjacent ponderosa pine stands (Buskirk 2002).
Northern goshawk (*Accipiter gentilis*)	S, MIS	X	X	Forages in a variety of forested areas and small openings; Nests primarily in dense mature conifer forests (Erickson 1987).
Peregrine falcon (*Falco peregrinus*)	S			Deep canyons with high vertical sandstone/limestone cliffs (Pettingill and Whitney 1965)
Northern harrier (*Circus cyaneus*)	S			Open country in medium/tall grass prairies and associated wetlands, marshes, meadows (USDA Forest Service 2004b)
Yellow-billed cuckoo (*Coccyzus americanus*)	S			Low elevation riparian areas and woodlands characterized with cottonwood-willow or burr oak (Panjabi 2003, FWS www 2003)
Burrowing owl (*Athene cunicularia*)	S			Dry grasslands and pastures, usually associated with prairie dogs or ground squirrels (Tallman et al. 2002).
Flammulated owl (*Otus flammeolus*)	S		X	Open ponderosa pine forests (Hayward and Verner 1994).
Lewis' woodpecker (*Melanerpes lewis*)	S		X	Open burned areas with large snags; oak and cottonwood forests (Anderson 2003, Panjabi 2003)
Black-backed woodpecker *(Picoides arcticus*)	S, MIS		X	Burned areas with a high density of pre-burn pine snags; Dense and/or mature pine forests with a high snag density (Anderson 2003, Panjabi 2003).
American three-toed woodpecker (*Picoides tridactylus*)	S, MIS		X	Mature spruce forests, possibly burned spruce habitat (Panjabi 2003).
Loggerhead shrike (*Lanius ludovicianus*)	S			Open country with scattered, low deciduous thickets (Tallman et al. 2002).
Grasshopper sparrow (*Ammodramus savannarum*)	S			Shrubby woodlands, groves, and thickets (Tallman et al. 2002)
Northern leopard frog (*Rana pipiens*)	S		X	Riparian and wetland areas for tadpoles, sub-adults, and breeding adults; upland habitats for foraging adults (Smith 2003a).
Black Hills redbelly snake (*Storeria occipitomaculata pahasapae*)	S	X	X	Moist habitats with well-developed ground litter (Smith and Stephens 2003).
Lake chub (*Couesius plumbeus*)	S, MIS			Large rivers at northern end of range and lakes when available; only known population is in Deerfield Reservoir (Isaak et al. 2003).

Species	Status *	Species Present **	Habitat Present ***	Habitat Description
Finescale dace (*Phoxinus neogaues*)	S, MIS			Cool, boggy spring waters often associated with beaver dams or small lakes; no documented occurrences on the South Dakota portion of the Black Hills National Forest (Isaak et al. 2003).
Mountain sucker (*Catostomus platyrhynchus*)	S, MIS		X	Most often in cool clear mountain streams but also in large rivers, lakes, and reservoirs (Isaak et al. 2003).
Cooper's Rocky Mountain snail (*Oreohelix strigosa cooperi*)	S, MIS		X	Lowland wooded or riparian areas on limestone soils (Frest and Johannes 2002)
Regal fritillary (*Speyeria idalia*)	S, MIS			Tallgrass prairie and extensive grasslands with violets. (Royer and Marrone 1992)

*T=Threatened, E=Endangered, P=Proposed, S=Sensitive, MIS=Management Indicator Species
**Confirmed records of species in area
***Suitable habitat known or suspected to occur

A number of the sensitive species listed in Table 3-15 have not been documented in the project area and no suitable habitat is known to exist in the project area. Therefore, proposed actions would have no impact on them. There would be no direct or indirect effects because these species or suitable habitats have not been documented in the project area. Absence of direct and indirect effects to these species equates to no cumulative effects. These species include the black-tailed prairie dog, peregrine falcon, northern harrier, yellow-billed cuckoo, burrowing owl, loggerhead shrike, grasshopper sparrow, lake chub, finescale dace, and regal fritillary butterfly. No further analysis is provided for these species.

Natural history information provided under species headings below are summaries of data most relevant to Black Hills populations, habitats and activities. More thorough information is provided for many of these species in the Forest Plan BE (USDA Forest Service 1996, Appendix H) and the Phase I Amendment BA/BE (USDA Forest Service 2001a, Appendix G). These documents are hereby incorporated by reference.

Bald Eagle

Bald eagles occur in the Black Hills mostly as winter residents or migrants. They are usually seen from early November through April (USDA Forest Service 1996). Roosts and feeding areas are important considerations on wintering grounds. Use across the district seems to be determined more by the availability of carrion, including road-kill deer, than any other single habitat factor. Wintering eagles are common in Spearfish Canyon near the western side of the project area. There are no known traditional roost sites in the Black Hills (USDA Forest Service 2002a), but the ponderosa pine landscape does provide abundant suitable roost structures that are used on a transitory basis. Transitory roost sites do not appear to be a limiting factor on the Forest.

There are no historical records of eagles nesting in the Black Hills, presumably because no suitable water bodies were present. In the spring of 2004, however, an eagle was observed sitting on a nest at a reservoir in the southern Hills just outside of the Forest boundary (USDA Forest Service 2005b). The nest was abandoned for unknown reasons shortly after its discovery. The South Dakota Department of Game, Fish and Parks will monitor the site in future years. No nesting sites are known or expected in or near the project area.

Bald eagle populations have been increasing nationwide in recent years (Federal register, Vol. 64, No. 128, Tuesday, July 6, 1999, Proposed rules). Nesting pairs in the lower 48 states have increased form 791 in 1974 to 6471 in 2000 (FWS WWW 2004).

Direct and Indirect Effects
The no action alternative would have no effect because no bald eagle habitat would be modified.

No nesting sites are known or expected in or near the project area. Therefore, there would be no direct or indirect effects to nesting bald eagles under either action alternative.

In accordance with standard 3101d, timber harvest activities would be avoided when stands are being used by roosting bald eagles on a transitory basis. Vegetation treatment activities may remove trees that could serve as potential transitory roost sites, but potential roost trees are not a limiting factor. Sufficient trees would remain to provide adequate transitory roost sites in the action alternatives, as indicated in Table 3-14. Based on this information, there would be no direct or indirect effects to bald eagles from either action alternative.

Cumulative Effects
Given the lack of direct and indirect effects, this project would not result in an incremental impact, and no cumulative effects are anticipated. For the same reasons, the project would not affect Forest-wide population or habitat trends, or attainment of objectives 220 or 221.

Determination
There would be no effect on bald eagles under any alternative because there are no nests in the project area, activities would avoid disturbance to transitory bald eagles, and sufficient potential roost trees would remain following implementation of both action alternatives.

Fringed Myotis
Fringed myotis use a variety of habitats, including ponderosa pine, white spruce and aspen forests. They roost primarily in caves, mines, and buildings, but also have been known to day-roost under loose bark. Maternity roosts most frequently occur in buildings (Schmidt 2003a). The project area includes suitable habitat for fringed myotis. There are no known roost sites or hibernacula in the project area. Potential habitat exists in mines the project area. Most of these mines have not been surveyed for bat use. Five hibernacula were monitored on the Forest in FY 2003, with this species found at one location (USDA Forest Service 2004b). It can be difficult to locate this species because it tends to hibernate individually, most often in cracks and crevices, and changes roost sites often in summer. Consequently, few observations have occurred despite monitoring efforts. In 2003, the Forest installed or repaired gates at eight roost sites to protect the species from human disturbance. This protection reflects an upward trend in known bat habitat and demonstrates active management to successfully accomplish the intent of Forest Plan objective 221.

Direct and Indirect Effects
Fringed myotis may occur in the project area, but there are no documented sightings. Because no activities are proposed adjacent to known mines or caves, primary bat habitat is unlikely to be affected. Individual bats could be affected if day-roost trees are cut. The no action alternative would have the least impact on bats because habitat modifications would not occur.

Cumulative Effects
This project would protect potential roost sites, caves, and snags through application of Forest Plan standards and guidelines (e.g., 1504, 2301-2306, 3102). There are no known, occupied caves or mines in the project area. Management activities are not expected to contribute to negative impacts at the landscape level. None of the alternatives would affect trend of availability of undisturbed caves and mines, this species' most critical and vulnerable habitat.

Past practices of snag removal during timber harvest and woodcutting activities, along with fire suppression, have probably altered snag distribution on the landscape. Snag removal under the action alternatives would have a small chance of affecting individuals but would be a rare

occurrence. The chance that the project would affect population trend across the Forest is negligible. Snag retention standards and road closures proposed under the action alternatives would reduce the potential for impacts to this species. Brown creeper and black-backed woodpecker, which are MIS for this project, are more dependent on snag habitat than fringed myotis and are more indicative of potential effects for this project on snag-dependent wildlife.

There are no proposed activities or known roost sites on lands to be exchanged. No other state or private activities are known to be planned in the project area. There are no current activities in the area that would reduce habitat suitability for this species. For these reasons, none of the alternatives would affect Forest-wide population trend, habitat trend, or attainment of objective 211.

Determination
The action alternatives may impact individuals but are not expected to result in a loss of viability in the Planning Area nor cause a trend toward federal listing. This determination is based on the limited potential of proposed activities to harm individual bats and remove suitable habitats, including day roost trees or unknown roost sites. There is a possibility that snags posing an operational hazard may be removed. This action occurs rarely and the species uses habitats other than snags. Known occupied cave and mine habitat does not occur on federal lands within the project area. The no action alternative would not affect fringed myotis because no activity would occur near mines, caves, and/or unknown roost sites and snags posing an operational hazard would not be removed.

Townsend's Big-eared Bat
Townsend's big-eared bats occupy a variety of habitats across their range. Most accounts of this species' habitat focus on the requirement for suitable roosts, including caves, mines, and rocky ledges and overhangs. Only caves and mines are known to be used as roosts in the Black Hills. Throughout much of its range, this bat is common in mesic habitats with coniferous and deciduous forests (Schmidt 2003b). The 2003 Monitoring and Evaluation Report (USDA Forest Service 2004b) indicates Forestwide population trend for Townsend's big-eared bats appears relatively stable or slightly increasing, and habitat trend is increasing. The project area includes suitable habitat for Townsend's big-eared bat, but there are no known roost sites or hibernacula in the project area. Not all potential habitat (mines) has been surveyed.

Direct and Indirect Effects
Townsend's big-eared bats may occur in the project area, but there are no documented roosts. The no action alternative would have no impact on bats because habitat modifications would not occur and there would be no tree removal. No activities are proposed under either of the action alternatives adjacent to any potential roost sites. Proposed activities are unlikely to affect Townsend's big-eared bats.

Cumulative Effects
This project would protect known roost sites, caves, and snags through application of Forest Plan standards and guidelines (e.g., 1504, 2301-2306, 3102). There are no known, occupied caves or mines in the project area. Management activities are not expected to contribute to negative impacts at the landscape level. None of the alternatives would affect trend of availability of undisturbed caves and mines, this species' most critical and vulnerable habitat.

There are no proposed activities or known roost sites on lands to be exchanged. No other state or private activities are known to be planned in the project area. There are no current activities in the area that would reduce habitat suitability for this species. For these reasons, none of the alternatives would affect Forest-wide population trend, habitat trend, or attainment of objective 211.

Determination

The action alternatives may impact individual bats but are not expected to result in a loss of viability in the Planning Area nor cause a trend toward federal listing. This determination is based on the limited potential of proposed activities to harm individual bats and suitable habitats, including unknown roost sites. Known occupied cave and mine habitat does not occur on federal lands within the project area. The no action alternative would not affect Townsend's big-eared bat because no activity would occur near mines or caves.

American Marten

The Revised Forest Plan BE (USDA Forest Service 1996) gives a thorough overview of American marten distribution and life history and is incorporated by reference. American marten was reintroduced to the Black Hills primarily to provide future trapping opportunities but also for their ecological and aesthetic value. Fecske (2003) reports adult martens are known to disperse in response to low prey abundance and intraspecific encounters in high-density, unharvested populations. She further reports that at the rate martens colonize vacant habitat, the marten population in the Black Hills could be at carrying capacity. Potential factors regulating marten populations in the Black Hills include low prey abundance, population saturation, a fragmented distribution of high quality habitat, and/or high predator abundance. Although considerable mortality and reproduction have likely occurred since reintroduction, it appears the marten population trend is relatively stable in the Black Hills. The habitat trend is also stable, indicating the Forest is meeting objective 221 (USDA Forest Service 2004b).

Martens show a preference for spruce stands that are dense and provide abundant near-ground structure such as low-growing branches and coarse woody debris. Long fire return intervals are also characteristic of marten habitat (Buskirk 2002). Martens generally avoid open areas and habitats that lack overhead cover; they appear intolerant of habitat types lacking at least 30 percent canopy cover (USDA Forest Service 2001a).

District records indicate four sight records, sign, and/or recoveries in the project area. Suitable marten habitat in the project area includes 13 stands (186 acres) of white spruce. No treatments are proposed in spruce stands.

Direct and Indirect Effects

The no action alternative would allow forest structure to continue to become more dense with higher recruitment of dead and downed woody debris. Because spruce is not widespread in the project area and none would be treated under any alternative, negative effects to optimal habitat would not occur. Neither action alternative proposes treatment in a ponderosa pine stand that provides an important connectivity corridor for marten, in accordance with Forest Plan standard 3215. Direct effects are unlikely in any alternative due to the absence of proposed treatments in preferred habitat in the project area.

Vegetation management that reduces pine stand density and coarse woody debris may reduce habitat suitability. Continuing mountain pine beetle infestation under the no action alternative would enhance marten habitat by increasing woody debris unless canopy cover decreases to less than 30%, which has already occurred in several areas. Thinning proposed under the action alternatives is designed to slow the spread of beetle infestation; this could reduce loss of marten habitat to beetles, but would have short-term negative effects through probable loss of woody debris. Stand-replacing fire is more likely to occur under the no action alternative and would negatively affect marten habitat. Because white spruce stands would not be treated and untreated areas would remain to facilitate marten movements, proposed management activities are unlikely to have noticeable indirect effects on this species.

Cumulative Effects

Past timber harvest and subsequent slash cleanup may have negatively affected characteristics of marten habitat such as spruce, dense stands, and down woody debris. Conversely, fire suppression has allowed spruce stands to persist and expand. None of the alternatives would affect high-potential marten habitat and thus would not add to negative cumulative effects on marten. Continued fire suppression may add to the cumulative effect of increasing spruce acreage and potential habitat. Harvesting denser stands of ponderosa pine would have the cumulative effect of reducing or preventing pine stands from becoming dispersal corridors. No known present or proposed actions on private or NFS lands would reduce preferred marten habitat. For these reasons, none of the alternatives would affect Forest-wide population trend, habitat trend, or attainment of objective 211.

Determination
The proposed action may adversely impact individuals but is not likely to result in loss of viability in the Planning Area nor cause a trend toward federal listing. Reducing density of ponderosa pine stands may reduce habitat suitability for dispersing marten. Following Phase I Amendment direction would maintain preferred marten habitat and marten viability Forestwide. The no action alternative would not affect marten because suitable habitat would not be altered. The chance of severe fires or insect epidemics, however, would increase under this alternative.

Northern Goshawk
Goshawks are adapted to forested habitats. In the Black Hills, goshawks usually nest in ponderosa pine. Nest sites are typically composed of mature to old-growth trees with relatively dense canopy. These stands have been characterized as 20 to 30 acres in size. Nest trees tend to be relatively large. Beyond the nest site is the Post-fledging Family Area (PFA), estimated at about 420 acres. These areas have a mosaic of large trees, large snags, mid-aged stands, small openings with a productive herbaceous understory, and coarse woody debris. This diversity is thought to be important for maintaining prey populations (Reynolds et al. 1992).

Goshawk surveys were conducted in the project area during 2000, 2001, and 2004. No previously unknown territories or nests were discovered. The project area includes one historically active goshawk territory, which was not active in 2004. Another territory is located just outside the project area's western boundary.

Over 180 acres of potential nest habitat were identified for the Strawberry territory. No treatment would occur in the historic nest stand or replacement stands under any alternative. No timing restrictions are required, since no treatment is proposed within a quarter mile of the historic nest stand.

One PFA, about 420 acres in size, is designated around the historic nest site. Small vegetation treatments totaling 24 acres are proposed in the PFA under both action alternatives. A commercial meadow enhancement would remove encroaching pine from a three-acre meadow. In addition to the proposed harvest treatment, non-commercial conifers would be removed from 21 acres of meadow. Fuelbreaks proposed adjacent to the Strawberry picnic ground (Alternative 2 only) would not change structural stage in the PFA. All the alternatives would maintain close to the current distribution of vegetation structural stages (p. 54).

Because the historic territory and the territory just outside the west end of the project area are estimated to extend throughout existing suitable habitat, no other PFAs were designated in the project area.

Under the no action alternative, foraging habitat would not change in the near future. Meadow enhancements proposed under both action alternatives and the fuel break under Alternative 2 would maintain and slightly increase foraging habitat.

Vegetation structural stage (VSS) distribution in the historic PFA is displayed in the tables below and would continue to move toward later successional stages. This would improve VSS balance in the longer term. Maintaining these stands in their present condition would benefit other species associated with dense forest, assuming stands are substantially altered by mountain pine beetles.

Vegetation structural stages are described in Table 3-16.

Table 3-16. Vegetation Structural Stage Description

Tree Size Class	DBH (“)	Minimum Canopy Closure %	Optimal % (range)
1 Grass/forb/shrub	0-1	None	10 (7-13)
2 Seedling/sapling	1-5	None	10 (7-13)
3 Young forest	5-9	None	20 (15-25)
4 Mid-aged forest	9-14	50	13 (8-18)
4 Mid-aged forest	9-14	60	7 (2-12)
5 Mature forest	14-20	50	20 (15-25)
6 Old forest	≥ 20	50	20 (15-25)

VSS distribution for 2005 and 2025 for the historic PFA is displayed in Table 3-17.

Table 3-17. PFA VSS Distribution

VSS	No Action Alternative		Alternatives A and B		Desired Range
	2005	2025	2005	2025	
1	5%	0%	6%	5%	7-13%
2	50%	35%	50%	30%	7-13%
3	2%	21%	2%	21%	15-25%
450	0%	0%	0%	0%	8-18%
460	43%	32%	43%	32%	2-12%
550	0%	12%	0%	12%	15-25%
650	0%	0%	0%	0%	15-25%

Direct and Indirect Effects

The no action alternative may have a positive effect on goshawk habitat by allowing stand density to increase, providing more potential nesting habitat for goshawks outside the existing PFAs. Conversely, lack of treatment could result in additional beetle infestation in these stands, which would decrease their suitability as nesting habitat. There would also be a greater chance of stand-replacing fire. Alternative 2 proposes treatment of 790 acres of SS 3C and 4C habitat (44% reduction) while Alternative 3 proposes treatment of 553 acres (31% reduction). Approximately 1,018 acres of suitable nesting habitat would remain under Alternative 2 and 1,255 acres under Alternative 3. Thinning would temporarily open these stands, reducing their suitability as nesting habitat. This effect must be compared, however, to the effect the ongoing mountain pine beetle infestation would have on these stands. Beetles are likely to reduce stand density more than thinning. Small patches of beetle-killed trees would provide prey habitat and goshawk foraging areas, but large openings created by stand-replacing infestation are unlikely to be used by goshawks. Overall, while thinning would temporarily decrease habitat suitability, the long-term effect would be more positive for goshawk than large-scale beetle infestation.

Direct effects can be assumed to include direct mortality by timber harvesters if active nest trees are felled prior to young fledging from unknown nests. Direct effects to adult birds are unlikely due to high mobility.

Small meadow enhancements proposed in the PFA under both action alternatives would maintain or improve foraging habitat. None of the proposed alternatives would negatively affect dense stands in the known PFA. Indirect effects of no treatment in this PFA would include eventual movement of some of the excess VSS 2 into VSS 3, filling that shortage over time. Similarly, excess VSS 460 would continue to grow into VSS 550 and VSS 650.

Cumulative Effects

The 2003 monitoring report (USDA Forest Service 2004b) indicates Forest-wide goshawk population trends may be stable to slightly decreasing due loss of nests to fire. Sample size may explain much of this change. Goshawk habitat has been relatively stable over the five-year reporting period Forest-wide, but observed natural events and management activities have caused some reduction in nesting habitat across the Forest. Proposed activities would work against this effect by striving to reduce stand mortality due to beetle infestation. All proposed treatments in the project area are within Phase 1 Amendment standards and guidelines established to ensure viability of the goshawk.

Determination
The proposed actions may adversely impact individuals but are not likely to result in loss of viability in the Planning Area nor cause a trend toward federal listing. This is because the action alternatives would reduce potential nesting habitat, but only outside of areas known to be used for nesting. The no action alternative could negatively affect goshawks by increasing the chance of catastrophic fire or insect epidemics.

Flammulated Owl
Flammulated owls are almost entirely insectivorous, feeding primarily on moths, beetles, and crickets. Evidence suggests that this owl breeds in ponderosa pine forests in holes excavated by woodpeckers. Flammulated owls prefer mature, open-canopy ponderosa pine forests with brush or saplings and avoid dense, young stands. Because flammulated owls are secondary cavity nesters, the presence of suitable cavities is a prerequisite for successful nesting. Almost all cavities used for nesting are excavated by woodpeckers.

At least two flammulated owls were observed by members of the Monitoring Birds of the Black Hills field crew in the northern Black Hills in 2002 (Panjabi 2003). The Forest was surveyed for owls in 2003 with negative results at 135 flammulated owl-calling stations (Fauna West 2003, unpublished).

Based on published information, it is reasonable to expect that suitable habitat for flammulated owl is present. There are 2,809 acres of mature, open ponderosa pine (habitat structural stages 4A and 4B) in the project area.

Direct and Indirect Effects
Under the no action alternative, the forest would continue to become denser. Open stand characteristics preferred by this species would decrease over time. Natural mortality of trees in the more open and mature stands may gradually increase snag numbers, increasing nesting and roosting habitat. Risk of stand-replacing fire, which would negatively affect flammulated owl habitat, could increase over time.

Direct effects of the action alternatives could include direct mortality if unknown active nest trees are felled prior to young fledging. In the long term, Alternatives 2 and 3 would increase mature, open-canopy pine stands (habitat structural stages 4A and 4B) by 685 and 338 acres respectively (12% and 6%). Harvest of large trees, which could otherwise become large snags, would occur under both alternatives but would be more prevalent under Alternative 2 (overstory removal harvests). Overall, both action alternatives would increase potential nesting habitat by reducing density of mature stands.

Potential breeding habitat could be affected by removal of snags, though this would be limited in scope. Additional snags will continue to be created by beetle infestation. Alternative 2 could be assumed to remove more snags for safety reasons than Alternative 3 due to greater acreage of timber harvest. Precommercial and commercial thinning of densely stocked stands may increase preferred habitat under either action alternative. A 12% increase in potential breeding habitat in the project area would occur under Alternative 2, while a 6% increase of breeding habitat would occur under Alternative 3.

Cumulative Effects
Fire suppression has decreased open habitats Forest-wide over time and vegetation management has probably decreased density of large-diameter snags. The current beetle infestation has created numerous snags. Harvest activities proposed under this project would maintain green trees to provide snags over time. Overstory removal harvest would add incremental impacts to past and present harvest activities by reducing open, mature forest. Proposed road closures would

discourage cutting of snags for firewood. These measures are designed to avoid increasing cumulative effects on snags that could provide flammulated owl nesting habitat. Because all new roads and some existing roads would be closed, proposed road construction and improvement would not add to cumulative effects of roading on wildlife habitat.

Determination
The project may adversely impact individuals but is not likely to result in loss of viability in the Planning Area nor cause a trend toward federal listing. While individuals may be lost if unknown nests are removed during proposed activities, only a small percent of available nesting habitat would be affected.

Lewis's Woodpecker
Lewis's woodpecker habitat occurs in old burns, stands of large, open pine (structural stages 4A, 5), and deciduous riparian habitat with snags at least 19" DBH. Haldeman (1980) describes Lewis's woodpecker as preferring deciduous trees in riparian situations as well as park-like ponderosa with understory of various shrubs, such as logged or burned forest when in early brush stage. Other accounts described this species as never common in the Black Hills (Pettingill and Whitney 1965).

This species prefers nesting in older snags (Anderson 2003); therefore, population trend is expected to increase as the age of a burn increases. Potential suitable habitat occurs on NFS lands in the small portion of the 2002 Grizzly Gulch burn that overlaps the project area. No treatments are proposed in the burned area under any alternative. Current potential habitat that occurs within structural stage 4A is probably marginal due to relatively small tree and snag size, as well as lack of a shrubby understory. Currently there are 1,743 acres of 4A habitat (33% of the ponderosa pine cover type).

The Forest monitors this species through the Rocky Mountain Bird Observatory (RMBO). Other woodpecker studies have been conducted in the Black Hills in the last five years by the South Dakota School of Mines and Technology, the University of Wyoming, and the Forest Service Rocky Mountain Research Station. RMBO observed three Lewis's woodpeckers in 2001, four in 2002, nine in 2003, and four in 2004 (Panjabi 2005). This species is strongly associated with burned areas. There are no recorded occurrences of Lewis's woodpeckers in the project area.

Direct and Indirect Effects
Alternative 2 would increase HSS 4A stands to 34% of ponderosa pine acres and Alternative 3 would remain at 33% of the ponderosa pine cover type; thus, they are very similar. Overstory removal treatments proposed in Alternative 2 would reduce potential habitat. All overstory removal treatments will retain a minimum of five square feet of basal area per acre in the largest size class to provide within-stand diversity.

Phase 1 Amendment snag retention requirements would assure that large-diameter trees are left and/or promoted on site to ensure occurrence of large snags in the future. Thinning would open the canopy, accelerating development of large-diameter trees. Prescribed burning is expected to develop and maintain a shrub component that may increase stand suitability.

Cumulative Effects
Potential suitable habitat within 7th level watersheds associated with the project area currently totals 30% of ponderosa pine acres. Treatments proposed under Alternatives 2 and 3 would increase potential suitable habitat to approximately 34% and 35% of pine acres, respectively. The Forest-wide trend toward increased commercial thinning and seed tree retention cuts presents long-term habitat benefits at the landscape level. Due to current lack of large trees on the landscape, treatments that remove large trees, such as overstory removal, are likely to create

habitat gaps. Forest Plan standard 2306 will ensure maintenance/creation of large-diameter trees and snags over time to the benefit of this species. Proposed road closures would discourage cutting of snags for firewood. Because all new roads and some existing roads would be closed, proposed road construction and improvement would not add to cumulative effects of roading on wildlife habitat.

Determination
The action alternatives may adversely impact individuals, but are not likely to result in a loss of viability within the Planning Area nor cause a trend to federal listing. Individual trees used by this species may be cut. Both action alternatives may benefit this species by increasing potential habitat.

Black-backed woodpecker
Black-backed woodpeckers are associated with montane coniferous forests (Bent 1939, Terres 1987). Black-backed woodpeckers excavate cavities and forage on wood-boring insects in areas with concentrations of dead and decaying trees and logs. Literature suggests a strong tie to insect infestations, post-fire conditions, and snag habitats for nesting, foraging and roosting.

The Forest monitors this species through the Rocky Mountain Bird Observatory (RMBO). Other woodpecker studies have been conducted in the Black Hills in the last four years by the South Dakota School of Mines and Technology, the University of Wyoming, and the Forest Service Rocky Mountain Research Station. RMBO observed 24 black-backed woodpeckers in 2001, 134 in 2002, 75 in 2003, and 67 in 2004 (Panjabi 2005). Insufficient data was collected in 2001 to make a reliable relative density estimate. The MBBH program highlights the importance of early-successional burns and late-successional forests to the black-backed woodpecker. Rumble (2002 unpublished) confirms that beetle-killed forest is also important. There are no documented occurrences of black-backed woodpeckers in the project area.

Habitats created by fire and insects are temporary and episodic. Black-backed woodpeckers have evolved with these conditions, and are known to have population irruptions (growths) that coincide with the events (Anderson 2003). The amount of time that black-backs fully exploit these habitats is variable, but population declines are expected within a few years of the initial irruption. The decline in black-backed woodpecker population observed only four years after the 2000 Jasper Burn is consistent with observations in other parts of the bird's range (Anderson 2003). The recent above-average amount of fire and beetle infestation has created more suitable habitat. Localized irruptions are expected to occur in these areas over at least the next few years. Jasper Burn colonization patterns suggest that black-backs probably began using the Grizzly Gulch and Battle Creek Burns during 2003 and may have already colonized the area burned in April 2005 by the Camp 5 Fire east of the project area.

Due to the amount of new habitat created and the number of birds observed, both the population trend and habitat trend appear to have been increasing for the black-backed woodpecker over the past several years (USDA 2004d). Current abundance, age of event, and pre-fire vegetation conditions could all influence the magnitude and timing of trends. Mountain pine beetles are active in the project area and many other parts of the Forest. The 2002 and 2003 Monitoring and Evaluation Reports indicate that an estimated 187,000 acres burned between 1998 and 2003, and nearly 200,000 acres were infested with mountain pine beetles and pine engravers by 2003, creating optimal habitat for the black-backed woodpecker. Several additional fires burning about 9,000 acres have occurred to date in 2005, and beetle infestation killed about 232,000 trees in 2004 (USDA Forest Service 2004b). Suitable habitat exists in the project area, mainly in pockets of beetle-killed trees and dense timber.

Direct and Indirect Effects

The no action alternative would have no direct effects. Alternatives 2 and 3 could result in loss of nests if occupied nest trees are cut for safety reasons during timber harvest. Cutting of live trees, which at times are used for nesting by black-backed woodpeckers (Anderson 2003), could directly affect this species. Cutting of insect-infested trees and hazardous snags would reduce foraging habitat.

Under the no action alternative, continued beetle infestation would produce more woodpecker habitat. Additional tree mortality and development of ladder fuels would increase the risk of stand-replacing wildfire. Both beetle infestations and stand-replacing fire would create black-backed woodpecker habitat.

Alternatives 2 and 3 include timber harvest prescriptions that would result in loss of large trees and reduction in stand density. Sanitation harvest could reduce foraging substrate and potential nesting sites. Silvicultural treatments aimed at reducing insects and disease could decrease abundance of prey species. Thinning treatments would promote the development of larger-diameter trees, which could become large-diameter snags. Dense pine stands totaling 790 acres are proposed for treatment in Alternative 2 while 553 acres are proposed for treatment in Alternative 3, a 44% and 31% reduction in dense pine habitat, respectively. Approximately 1,016 acres of dense pine habitat would remain in the project area under Alternative 2 while approximately 1,253 acres of suitable habitat will remain in the project area under Alternative 3. Alternative 3 would therefore affect black-backed woodpecker habitat less than Alternative 2. The no action alternative would affect black-backed woodpeckers least because it would conserve existing habitat while allowing for natural succession to make the stands more susceptible to beetle infestation and fire risk, both factors that create optimum habitat.

Cumulative Effects

Fire exclusion has resulted in a more pine-dominated, continuously forested landscape. Timber harvest over the years has resulted in fewer large-diameter trees, less natural mortality, and more trees overall. The no action alternative would continue this trend, though susceptibility to insect infestations and stand-replacing fire would increase with stand density and stagnation; these events would increase habitat for black-backed woodpeckers. The 2003 monitoring report indicates that due to the amount of new habitat created and the number of birds observed, both the population trend and habitat trend appear to have been increasing for the black-backed woodpecker over the past several years (USDA Forest Service 2004b).

Fire suppression would continue under all alternatives, and the type of burns proposed under Alternatives 2 and 3 would most likely not result in the type of post-fire conditions most suitable as black-backed woodpecker habitat. Snag retention and replacement measures included in these alternatives would help assure a long-term supply of snags. Proposed road closures would discourage cutting of snags for firewood. Because all new roads and some existing roads would be closed, proposed road construction and improvement would not add to cumulative effects of roading on black-backed woodpecker habitat. In the absence of large fire events, the project area's suitability for this species would change little under any alternative. Effects on Forest-wide population trend would be negligible.

Determination

The proposed activities may adversely impact individual black-backed woodpeckers, but are not likely to result in loss of viability in the Planning Area, nor cause a trend toward federal listing. Although dense mature habitat in the project area would decrease under both action alternatives, population and habitat trends Forest-wide are more influenced by fire and beetle infestations than the availability of dense mature ponderosa pine stands. Because beetle infestation is likely to continue in the project area and elsewhere under any alternative and because large areas of

recently-burned timber exist on the Forest, effects on Forest-wide population and habitat trends as a result of this project would be negligible.

American Three-toed Woodpecker

The three-toed woodpecker is a cavity nester occurring primarily in coniferous forests, particularly spruce (Clark et al. 1989). Closed-canopy spruce stands are preferred for nesting (Weydemeyer and Weydemeyer 1928). Three-toed woodpeckers have been recorded in late-successional pine stands in the Black Hills, but only where white spruce was a prominent feature of the forest surrounding count stations (Panjabi 2001). Foraging occurs in areas with abundant dead and decaying trees infested with wood-boring insects, especially newly burned areas (Hutto and Young 1999, Murphy and Lehnhausen 1998, DeGraff et al. 1991). Snags are required for nest cavity excavation.

There are no records of three-toed woodpeckers in the project area, but suitable habitat exists in beetle-infested areas and the few spruce stands.

Direct and Indirect Effects

Under the no action alternative, mountain pine beetle infestation is likely to continue in dense stands. These conditions and development of ladder fuels would increase the risk of severe wildfires. Small wildfires could create three-toed woodpecker foraging and habitat, though stand-replacing fires could destroy preferred habitat if spruce stands or pine stands with a large percentage of spruce are burned.

No management activities are proposed in spruce stands under either action alternative. Effects of timber harvest and beetle infestation would be similar to those described for black-backed woodpecker, above.

Cumulative Effects

Fire exclusion has resulted in a more pine-dominated, continuously forested landscape. Timber harvest over the years has resulted in fewer large-diameter trees, less natural mortality, and more trees overall. The no action alternative would continue this trend, though susceptibility to insect infestations and stand-replacing fire would increase with stand density and stagnation; these events would increase habitat for black-backed woodpeckers. The 2003 monitoring report indicates that the American three-toed woodpecker population trend is upward in the Black Hills and habitat trend appears stable. The Forest is meeting objective 221 for the species (USDA Forest Service 2004b).

Snag retention and replacement measures included in these alternatives would help assure a long-term supply of snags. Proposed road closures would discourage cutting of snags for firewood. Because all new roads and many existing roads would be closed after vegetation treatments are completed, proposed road construction and improvement would not add to long-term cumulative effects of roading on three-toed woodpecker habitat. Continued beetle infestation would increase the project area's suitability for this species, although spruce stands are unlikely to expand substantially in the near future. The proposed activities are unlikely to impact three-toed woodpeckers in the project area or their habitat trend and population trends across the Forest. Attainment of objective 221 would not be affected.

Determination

The proposed action may adversely impact individual three-toed woodpeckers but are not likely to result in loss of viability in the Planning Area nor cause a trend toward federal listing. White spruce would not be harvested under either action alternative. However, some less-preferred dense pine habitat would be affected by project activities. Individual nest trees may be harvested

during activities, which could affect individuals; effects on Forest-wide viability would be negigible.

Northern Leopard Frog

Leopard frogs breed and are most abundant in small stock ponds and beaver ponds lacking predatory fish, and generally avoid faster moving water. They over-winter in permanent water that does not freeze solid and forage in upland sites where there is adequate cover.

Baseline monitoring data on distribution and abundance have been gathered (USDA Forest Service 2003a). There are several small streams and stock ponds as well as other water sources throughout the project area that provide suitable habitat for the leopard frog. No management activities are proposed in riparian areas that would provide the best reproductive habitat for the frog.

Direct and Indirect Effects

The no action alternative would have the least impact on frogs because habitat modifications would not occur and there would be no increase in vehicle traffic that may add to direct mortality. Motorized vehicles could continue to disturb wet areas and possibly kill frogs. Road work and timber harvest proposed under Alternatives 2 and 3 could result in mortality of individual frogs, but impacts on wet areas would be minimized with implementation of Watershed Conservation Practices and Best Management Practices. Road closures may decrease negative direct effects on frogs. Alternatives 2 and 3 may increase foraging habitat by increasing structural stages 1 and 2 by 60 acres. From a reproduction habitat standpoint, there would be little difference, if any, between the action alternatives, since breeding habitat would not be affected by proposed activities. Indirect effects on frogs would be negligible with implementation of measures to prevent or minimize impacts on water quality and moist soils.

Cumulative Effects

Fire exclusion and other events have cumulatively altered historic riparian and wetland areas. None of the alternatives is likely to add to cumulative effects, and road closures may help counteract cumulative effects. Habitat would remain suitable for the frog during and post-treatment allowing for continued use and occupancy.

Determination: The proposed activities may adversely impact individual frogs but are not likely to result in a loss of viability in the Planning Area nor cause a trend toward federal listing. Mortality of individual frogs may occur due to harvest activities and machinery, but no activities would occur in riparian areas under either alternative.

Black Hills Redbelly Snake

The Black Hills redbelly snake is found in moist woodlands with rocks, logs, leaf litter, and other ground cover. Redbelly snakes often hibernate in rocky areas and are vulnerable when crossing roads that run between rocky hibernation sites and riparian woodlands, as well as when basking on roads. According to the South Dakota Natural Heritage Database and district records, one redbelly snake has been observed in the project area.

Direct and Indirect Effects
Displacement of individual snakes may occur under the action alternatives as ground cover is moved during skidding operations. Habitat would continue to be provided through compliance with Forest Plan standard 2308. No barriers adjacent to wetlands or riparian areas would be created under any action alternative. Open road density would decrease under the action alternatives, reducing the potential for vehicle-caused mortality. Prescribed burning has the potential to kill individual snakes and temporarily impact snake distribution by affecting ground vegetation characteristics.

Alternative 3 proposes hardwood restoration. Relatively mesic stands with a hardwood component have a higher than average chance of use by redbelly snakes. Direct mortality could occur during these treatments, but restoration would maintain or improve habitat suitability for this species.

Cumulative Effects
Traffic associated with proposed activities could cause snake mortality, adding to cumulative effects of roading. Proposed road closures and decreased risk of stand-replacing fire would counteract cumulative effects of roading and fire suppression, both of which have compromised this species' habitat. Overall, Alternatives 2 and 3 would counteract effects of prior management to some degree by small-scale reintroduction of fire, reduction of stand density, restoration of hardwoods, and road closures. These changes would benefit redbelly snakes.

Determination
Proposed activities may adversely impact individual redbelly snakes but are not likely to result in a loss of viability in the Planning Area nor cause a trend toward federal listing. Both alternatives could cause direct mortality to individual snakes, but would ultimately reduce risk through road closures and maintain or improve potential habitat.

Mountain Sucker
Mountain suckers are native to the Black Hills. They occur most often in cold, clear mountain streams. Stream substrate associated with mountain sucker habitat varies widely and ranges from mud to sand, gravel and boulders, although cobbles are most common. This species is found on the stream bottom and is closely associated with cover such as exposed roots, undercut banks, log jams, and boulders. Mountain suckers are benthic feeders and their diet is primarily simple plants like diatoms (single-celled algae with hard shells) and green algae, but small invertebrates are also ingested.

Recent surveys suggest that mountain suckers occur in many Black Hills drainages in which they were historically found (Isaak et al. 2003), but localized population reductions may have occurred. Of the streams surveyed in or adjacent to the project area in 1997, 1998, and 2000, mountain suckers were found in Bear Butte Creek, Strawberry Creek and Whitewood Creek.

Direct and Indirect Effects
Proposed activities would have no direct effects on mountain sucker. Indirect effects could include exposure of bare mineral soil during road work, timber harvest, and prescribed burning. Reduction in leaf litter and herbaceous plants could result in increased sedimentation. Implementation of BMPs and WCPs would minimize sediment transport due to proposed activities and effects on mountain sucker habitat. Water yield could increase due to reduced transpiration and raindrop interception, but would likely be short-term and immeasurable because of the size of the areas treated and regrowth of vegetation.

Proposed activities would include removal of vegetative cover and soil disturbance during timber harvest, road work, and prescribed burning. These activities can increase sedimentation,

concentrate runoff, possibly alter surface and subsurface flow and potentially impact water quality. Potential for negative effects on water quality would be minimized through use of BMP-related design criteria such as surfacing roads with gravel, revegetating exposed soils, and establishing sedimentation traps in drains leading to streams.

Cumulative Effects
Past activities such as road construction, timber harvest, and mining resulted in ground disturbance and vegetation removal. These impacts have decreased over time as revegetation occurred. An adverse effect to aquatic habitat occurs if and when excessive sediment is mobilized and transported into streams. As different units are harvested each year, previous units will have already begun recovery of forest floor vegetation and ground litter from cast leaves and needles.

Impacts on water quality and yield from prescribed fire activity would not be additive to those impacts from timber harvest because they would occur as temporally separate events. If there are effects on water quality from prescribed fire it would be temporally distinct, occurring after timber harvest sites have begun recovery through vegetative re-growth. The effects of sequential prescribed burns within the watershed would depend on their locations and distances from intermittent and perennial streams, but overlap of indirect effects (incremental increases) would probably occur. As with timber harvest, the first areas burned would have begun recovery before subsequent areas are burned, with any effects on water quality expected to last only for one to two growing seasons after the last burn has been achieved. Long-term effects on mountain sucker are not anticipated because of swift terrestrial vegetative recovery and natural flushing of stream systems through normal rain events.

Proposed activities in combination with past, present, and foreseeable actions would not negatively impact mountain sucker provided all planned design features, mitigation measures, BMPs, and Forest Plan standards and guidelines are implemented. Activities would have a neglible effect to no effect on Forest-wide habitat and population trends.

Determination
Proposed activities may adversely impact individual mountain suckers but are not likely to result in a loss of viability in the Planning Area nor cause a trend toward federal listing. The activities would not fragment stream habitat or further reduce the distribution of this species or permanently reduce the number of individuals on the Forest. The wide distribution and high abundance of mountain suckers at many sites in the Black Hills, even after more than a century of intensive land use, suggests that current risks for this species are minimal (Isaak et al. 2003).

Cooper's Rocky Mountain Snail
The project area includes suitable habitat but no documented colonies of the Cooper's Rocky Mountain snail. This snail is associated with calcareous soils and is usually found in lowland wooded areas and talus slopes.

Frest and Johannes (1993) list threats to this species as road construction, grazing, logging, and major forest fires. They state that colonies also avoid dry areas and open ground.

Direct and Indirect Effects
None of the alternatives propose activities in locations with documented snail colonies. There would be no road construction in preferred habitat. Snail colonies that were not detected during surveys may experience direct effects. The degree of impact is expected to be minimal given the survey effort completed to date to identify snail colonies and the location of treatment units in habitat only marginally suitable for this species. Indirect effects could include drying of potentially suitable habitat as a result of tree thinning. Activities proposed in potentially suitable

habitat are limited to hardwood restoration; because this activity is proposed on a small percentage of the project area and the objective of the treatment is to enhance the hardwood component of the stand, substantial or lasting effects on snail colonies are unlikely to occur.

Cumulative Effects
None of the alternatives would add to cumulative effects on known snail colonies. Proposed activities could add to cumulative effects on unknown colonies, though the location of treatments outside preferred habitat minimizes this possibility.

Determination
Proposed activities may adversely impact individual Cooper's snails but are not likely to result in a loss of viability in the Planning Area nor cause a trend toward federal listing. Proposed activities would have no effect on known colonies and would take place outside preferred habitat.

Management Indicator Species

Management indicator species (MIS) can be used to indicate effects on a wider group of species that share similar habitat requirements. MIS can also be species of particular interest for other reasons, e.g. sensitive species or big game. In this analysis, a subset of MIS was selected from the Forest Plan MIS list to represent the effects of management activities on those species relevant to this project.

Nineteen wildlife species are listed as MIS in the Black Hills. Fifteen of these species are known to occur or have habitat in the project area. These include bald eagle, Townsend's big-eared bat, fringed myotis, American marten, northern goshawk, black-backed woodpecker, American three-toed woodpecker, Cooper's Rocky Mountain snail, pygmy nuthatch, white-tailed deer, mule deer, elk, brown creeper, Merriam's turkey, and mountain lion. Species that are also threatened, endangered, proposed, or sensitive are discussed in the previous section.

Five fish species are MIS in the Black Hills. They include brook trout, brown trout, finescale dace, lake chub and mountain sucker. Brook trout, brown trout, and mountain sucker occur in the project area. Mountain sucker is evaluated in the previous section. Instream fisheries habitat was also designated as an MIS habitat component to be used as an ecological indicator and is discussed below.

Wildlife species not selected as MIS analysis include Cockrell's striate disc, osprey, regal fritillary butterfly, and mountain goat. These species were not selected for analysis because they and their habitat do not occur in the project area. Fish species not selected included finescale dace and lake chub because of their absence from the project area. Finescale dace occur in the Redwater River drainage in the Wyoming part of the Black Hills, and no occurrences have been documented on the South Dakota portion of the Forest (Isaak et al. 2003). The sole known population of lake chub on the Forest is in Deerfield Reservoir in the Castle Creek drainage, which is outside of the project area.

Brown Creeper *(Certhia americana)*

Brown creepers are associated with denser mature coniferous habitat with dead trees, mixed deciduous woodlands, and mature forests. This species occurs in greatest density in white spruce and late-successional pine habitat (Panjabi 2004). Nests of twigs and mosses are built under loose bark of dead trees at least 10" DBH. Diet is composed of insects and larvae including weevils, leaf beetles, aphids, ants, caterpillars, moths, and spiders (Terres 1987). Optimal habitat in the project area is spruce and pine structural stages 4B and 4C.

Wiggins (2005) reported that brown creepers have stringent habitat requirements: high canopy-cover portions of the forest with many mature trees. Creepers are often closely associated with late-successional ponderosa pine forests and may be the species most sensitive to heavy (e.g. clearcut) logging.

Since the 1960s, qualified volunteers and professional biologists have worked in partnership with the Forest Service to complete breeding bird survey (BBS) routes annually as part of a national program administered by the U.S. Geological Survey. Five routes were initially used in the Black Hills; now there are 15 routes. BBS survey data specific to the Black Hills for the period 1966-2002 identify a positive 35.5% trend in population (Sauer et al. 2003). The reliability of this trend estimate is affected by small sample size.

Observations of brown creepers have remained steady over the last four years of Rocky Mountain Bird Observatory monitoring. The brown creeper is well-distributed in low abundance throughout the Black Hills (Panjabi 2003, 2004). The distribution and abundance of brown creepers appears to be closely tied to the availability of mature and old-growth stand conditions, as evidenced by the fact that 92%, 96%, 90%, and 100% of all brown creeper observations in 2001, 2002, 2003, and 2004, respectively, were recorded at sites where the surrounding habitat was classified as either seral stage 4 or 5 (Panjabi 2001, 2003, 2004, 2005). Based on the number of observations, populations appear relatively stable over the last four years.

Direct and Indirect Effects

The project area contains 186 acres of white spruce and 2,681 acres of structural stage 4B and 4C pine habitat. No activities are proposed in white spruce habitat. The no action alternative would retain the most habitat preferred by the brown creeper, though further spread of the current mountain pine beetle infestation to dense stands is likely to be more widespread under this alternative. This condition, along with continued development of ladder fuels, would increase the risk of severe wildfires. Stand-replacing fire would destroy brown creeper habitat in burned areas, and this habitat would not again be available until large-diameter trees and snags developed.

Alternatives 2 and 3 would result in fewer large trees in the near term and reduction in stand density. Neither action alternative would stop the beetle infestation entirely nor substantially affect existing beetle-killed trees that could provide nesting habitat. Forest Plan direction to provide sufficient large-diameter green trees across the landscape for snag recruitment would be met. Thinning treatments would prevent stand stagnation and allow development of larger trees over time. Thinning proposed in 254 acres of structural stage 4C (p. 9) would move the stands toward late-succession conditions while reducing risk of stand loss to mountain pine beetle. This treatment would increase the chance the stands would develop into late-succession rather than experience substantial mortality. Risk of stand-replacing fire and resulting habitat destruction would decrease in all thinned areas. Alternative 2 would increase structural stage 4B to 1,716 acres (+38%) and decrease 4C to 878 acres (-46%). Alternative 3 would increase structural stage 4B to 1,406 acres (+24%) and decrease 4C to 1,093 acres (-33%). Alternative 2 has the greatest potential for short-term negative effects on brown creeper.

Individuals could be directly affected if snags with occupied nests were cut during activities proposed under Alternatives 2 and 3. Only hazardous snags would be cut (see snag analysis section), so this effect is expected to be negligible.

Cumulative Effects
Timber harvest and road building have decreased habitat for this species by removing large trees and snags and preventing widespread natural mortality of large trees. Fire suppression and other actions have probably decreased hardwood acreage. This project would continue the trend of reduction in acreage of mature, closed-canopy stands and, at least in the short term, loss of large-diameter trees. This negative effect on habitat should be viewed in light of the expanding mountain pine beetle infestation, which can and has resulted in complete stand mortality. Proposed activities are likely to slow the mortality rate, allowing stands to maintain or redevelop characteristics of brown creeper habitat. Furthermore, both alternatives would work towards development of late-succession characteristics in stands otherwise at high risk of beetle infestation. Snag and large green tree retention would maintain additional habitat features. None of the alternatives would negatively affect Forest-wide habitat or population trend.

Since commercial thinning, as proposed in this project, emphasizes retention and release of larger trees, growth rates in these trees would be more rapid than if the stand were left untreated. Thus, the action alternatives would create short-term losses in habitat availability, but long-term development of larger trees.

Merriam's Turkey (*Meleagris gallopavo*)
Merriam's turkey habitat includes coniferous, deciduous, and mixed woodlands (Tallman et al. 2002). Selected habitat during the summer is open ponderosa pine, while winter habitat is dense pine. Adult turkeys seldom select meadow habitat. Poults tend to select meadow/forest edges and are seldom observed more than 10 meters from the forest edge (Rumble 1990). Roost trees selected by Merriam's turkeys are typically large-diameter older trees with flat tops and large horizontal branches (Rumble 1992). During the summer, turkeys consume grasses and grass seeds as primary food categories, while in winter ponderosa pine seeds are consumed where available.

Direct and Indirect Effects
The no action alternative would allow for the continued increase of dense ponderosa pine canopy cover that may provide more preferred wintering habitat. This alternative could also increase mature trees preferred for turkey roosting. Continued canopy closure resulting from this alternative may reduce preferred summer habitat, when turkeys tend to select more open canopy ponderosa pine cover. Widespread tree mortality resulting from beetle infestation is likely to create larger openings than generally preferred for foraging.

No direct effects are anticipated under either action alternative because of the mobility of the species. Indirect effects from Alternative 2 would include a reduction of dense-canopy ponderosa pine by 790 acres, resulting in less preferred winter habitat. Alternative 3 would reduce preferred winter habitat by 553 acres. Both action alternatives would maintain turkey roosting trees by retaining suitable trees in accordance with Forest Plan guideline 2305 (treated as standard under the Phase 1 Amendment). Alternative 2 would increase preferred summer habitat by 790 acres (+15%) and Alternative 3 would increase preferred summer habitat 553 acres (+12%). Reduction in spread of beetle infestation would allow stands to remain suitable habitat rather than becoming large openings.

Cumulative Effects
Forest Plan objective 217 supports habitat management for 20,000 to 30,000 turkeys in the South Dakota part of the Black Hills. Turkey populations are monitored through South Dakota Department of Game, Fish and Parks (SDGFP). This monitoring indicates that turkey populations are continuing to grow (SDGFP 2004). While the no action alternative may allow continued growth of a more dense forest in the project area, both action alternatives propose treatments that would alter structural stages and result in differing mixes of preferred summer and winter habitat. Untreated areas in both alternatives would continue to grow more dense unless infested by beetles, providing more suitable wintering habitat, while treated areas would become more open, providing more preferred summer habitat. Estimates of turkey populations show a doubling of turkey populations between 1998 and 2002, from 9,000 birds to 18,500 birds (USDA Forest Service 2004a) and an estimated 19,000 birds in 2003 (SDGFP 2004). Both action alternatives would provide a mix of open and closed ponderosa pine stands that support achievement of objective 217. Both population and habitat trend data suggest the Forest is meeting objectives 217 and 221 (USDA Forest Service 2004b).

Mountain Lion (*Felis concolor*)
The mountain lion's current distribution, primarily in western North America, is closely tied to its main prey, mule deer and white-tailed deer. Mountain lions typically occur in remote, undisturbed areas, including mountainous habitat, watercourses with sufficient cover, riparian woodlands, and rough, broken country with rocky cliffs or ledges (Higgins et al. 2000). Home range size varies with season of year, prey distribution and density, and an individual lion's age and sex.

Current research in the Black Hills indicates approximately 61-80 adult mountain lions currently reside in suitable habitat in the Black Hills. Including sub-adults, the estimate is 129-152 animals (Fecske 2003). SDGFP believes the mountain lion population has increased since the animal was classified as state threatened in 1978 and has proposed a hunting season. Mountain lion population is stable to upward and prey habitat has been stable to increasing (USDA Forest Service 2004b).

Direct and Indirect Effects
None of the alternatives are likely to directly affect mountain lions due to their mobility and apparent avoidance of human presence and activities. In the long term, the no action alternative may result in lower habitat capability for mountain lion prey species due to continued forest closure. Both action alternatives would increase habitat effectiveness for deer, which could indirectly benefit mountain lions.

Cumulative Effects
While no population objective has been established by SDGFP for mountain lions, the population is reported to be stable to upward (USDA 2004a). The action alternatives would meet Forest Plan objectives 217, 218, and 221 for maintaining, conserving, and enhancing habitat and increasing habitat capability for deer and elk. Increased habitat capability for deer and elk should positively affect mountain lion primary prey and result in positive effects for mountain lions. Proposed activities would likely have a positive effect on Forest-wide mountain lion habitat and population trends. If a lion hunting season is established, proposed road closures would help provide secure habitats.

Pygmy Nuthatch (*Sitta pygmaea*)

Pygmy nuthatches feeds almost exclusively in pines. They typically seek static insect food in needle clusters, cones, twigs, branches, and trunks. Because this species nests primarily in dead pines and live trees with dead sections, it prefers mature and undisturbed forests that contain a number of large snags. Pygmy nuthatch abundance correlates directly with snag density and foliage volume of the forest but inversely with trunk volume, implying a need for heterogeneous stands with a mixture of well-spaced, old pines and vigorous trees of intermediate age (Ghalambor 2003). They require large diameter snags (at least 17" DBH) for excavation of nest sites (Raphael and White 1984).

Peterson (1990) lists pygmy nuthatch as a rare transient in the higher Black Hills. Tallman et al. (2002) report that in the Black Hills the pygmy nuthatch is a rare permanent resident below 5,500 feet.

The Forest monitors this species through the Rocky Mountain Bird Observatory. Three pygmy nuthatches were observed in 2001, two in 2002, none in 2003, and one in 2004 on fewer transects than were surveyed in previous years (Panjabi 2005). The species' rarity is confirmed through Breeding Bird Survey efforts, as only one bird has been detected on the Forest despite numerous annual surveys. Other Black Hills sightings have occurred infrequently but regularly in recent years, always of groups of nuthatches. Habitat appears to be stable or decreasing slightly (USDA 2004a). There are about 1,743 acres of open, mature pine habitat in the project area. Large-diameter snags are probably deficient and may limit population distribution. Much of the area is at or above the elevation mentioned by Tallman to be considered suitable habitat.

The pygmy nuthatch was selected as MIS for this project because of its association with mature ponderosa pine seral stages. Other selected MIS are also indicators for the same habitat and provide good determinations for Forest-wide trend. These other species include black-backed woodpecker, brown creeper, and goshawk. According to the 2003 Monitoring Report (USDA Forest Service 2004b), goshawk populations appear relatively stable or slightly decreasing due to habitat lost to wildfires, brown creeper populations appear relatively stable or slightly decreasing, and black-backed woodpeckers are increasing. The relationship of this project to these Forest-wide trends is addressed earlier in this document and should be used to supplement this discussion for the pygmy nuthatch.

Direct and Indirect Effects

Direct effects could include mortality if trees with active nests are cut. Under the no action alternative, stands would continue to become denser unless infested by beetles. More snags may be created due to natural succession, insects, and disease. Open, mature pine habitat would increase by 35 acres under Alternative 2 and decrease by two acres under Alternative 3. Increases in structural stage 4A habitat and its benefit to pygmy nuthatches would be contingent upon recruitment of snags for nesting. Both action alternatives would prohibit cutting of snags except those deemed as safety hazards. Thinning treatments would promote the development of larger-diameter trees, which would eventually provide large-diameter snags.

More pygmy nuthatches have been detected in the four recent years of MBBH efforts than during a decade of BBS routes. The absence of observations during several years of surveys can be expected of a rare species and should not be interpreted as a decline or local extirpation without long-term absence data. Similarly, a modest, short-term increase in detections for such a rarely sighted species would not be strong evidence for a population increase.

Cumulative Effects
Survey-wide estimates of all BBS routes suggest pygmy nuthatch populations are stable, although this data is based on a small sample size. Where long-term data are available for the species, natural fluctuations in populations numbers have been documented. It is suspected that these fluctuations may be due to intolerance of cold winter temperatures and/or a lack of a food source as a result of poor cone crop (Ghalambor 2003).

Nest trees may be lost and potential nesting habitat for this species would be decreased by the removal of commercial wood in the proposed cutting areas, which may negatively impact this species' habitat. Pygmy nuthatch appears to be associated with snags and relatively large trees; since all alternatives would conserve habitat by retaining most snags and sufficient large-diameter green trees to provide snags over time, effects on Forest-wide population and habitat trends are likely to be negligible.

White-tailed Deer (*Odocoileus virginianus*)
Higgins et al. (2000) report that white-tailed deer inhabit a variety of forest types and other habitats including grasslands, agricultural lands, deserts, swamps, and urban settings, while mule deer occur in semiarid deserts, riparian areas, grasslands broken by river breaks, shrub and forested areas, mountain foothills, and tundra. In the Black Hills, open stands and grasslands are used for forage while dense pine stands are used for winter cover and for escape cover during hunting seasons. Spruce and aspen stands are used for summer thermal and hiding cover. Results from a Black Hills deer study (Kennedy 1992) showed that aspen stands are highly selected during fawning season. Abundant forage on summer range can help deer enter the winter months in better condition. Prescribed burning and reduction of the timber canopy increase forage and browse production (Alexander 1987, Uresk and Severson 1989), but may do so at the expense of cover. Tradeoffs need to be analyzed and a well-distributed balance achieved.

Optimal summer forage areas for white-tailed deer in the Black Hills consist of the following types and structural stages: wet and dry meadows; aspen (all stages), and open spruce and pine. Summer cover is dense pine and spruce. Optimal winter habitat in the Black Hills is dense pine for cover, and meadows, aspen, and small openings for forage.

In the Black Hills, white-tailed deer are considered common to locally abundant and are known from all counties. Approximately 66-75% of the overall deer population in South Dakota part of the Black Hills is white-tails (USDA Forest Service 1997a). The 2003 monitoring report indicates Forest Plan objective 217 supports habitat for management of 60,000 deer in the Black Hills, which matches the state population objectives (USDA Forest Service 2003). Local population trend is stable but varies annually (SDGFP unpublished data).

Direct and Indirect Effects
The Mineral project area is considered deer summer range. Treatments proposed under both action alternatives would result in increased habitat effectiveness in Management Area 5.1 for summer and winter habitat effectiveness. All values would remain above standards.

Current habitat conditions in the project area include approximately 51% of the ponderosa pine cover type in dense to moderately dense mature stands with little forage in the understory. Pine stands with open understory currently total about 35% of pine cover type. Hardwood stands are slowly transitioning to conifer as more pine becomes established. Ponderosa pine is also encroaching into meadows. Optimal hiding cover in the form of 3C stands is limited, and open road densities average four miles per square mile. Existing habitat suitability would remain unchanged under the no action alternative.

Treatments under the action alternatives would remove encroaching pine from hardwood stands and meadows, reduce ponderosa pine stand densities, and reduce mileage of open roads. Open understory ponderosa pine would increase by about 1% under both action alternatives, though prescribed burning, which would occur on 1,127 acres under Alternatives 2 and 3, would also improve foraging habitat. Open road densities would be reduced to 2.77 and 2.86 miles per square mile under Alternatives 2 and 3, respectively.

Table 3-18 displays habitat effectiveness values for white-tailed deer for each alternative. In all cases, habitat effectiveness would increase compared to existing conditions.

Table 3-18. White-tailed Deer Habitat Effectiveness

Standard	No Action	Alternative 2	Alternative 3
Summer = .40	.40	.45	.45
Winter = .35	.40	.44	.43

Cumulative Effects
Black Hills National Forest white-tailed deer populations increased approximately 33% between 1998 and 2003 (SDGFP 2004). The 2003 Monitoring Report (USDA Forest Service 2004b) indicates habitat is not the limiting factor for deer herds in the Black Hills. Loss of traditional winter range to development has likely had the greatest impact. Fawn mortality can be influenced by a wide range of factors. Regenerating aspen is very important to does during fawning; this habitat has increased since the mid-1980s, and both action alternatives would continue this trend.

The action alternatives would improve deer habitat effectiveness and would positively affect Forest-wide habitat and population trends. Habitat capability values have increased across the Forest in the last five years. Habitat capability values would improve under all action alternatives. Assuming that the HABCAP model reasonably portrays habitat conditions, monitoring data suggest population growth is not being limited by habitat and objectives 217 and 221 are currently being met. The action alternatives would continue this trend.

Elk *(Cervus elaphus)*
Habitat used by elk varies, with meadows and other brushy open areas used for foraging and denser timber used for cover. Grasses, sedges, and forbs are important items in summer diet; twigs, leaves, and grass comprise the winter diet (Higgins et al. 2000). Migration may occur between higher and lower elevations, but most of the Black Hills is considered year-round range. The majority of the project area is mapped as summer range.

Elk are widespread throughout the western US from Canada to Mexico with isolated populations elsewhere, including Pennsylvania and Virginia (Whitaker 1980). Occurrences of elk in all Black Hills counties are relatively common due, in part, to transplants (Higgins et al. 2000). Current Black Hills population is estimated at 4,200 animals. Population trend is upward. Habitat trend on the Forest is stable, but residential development may be reducing habitat in some areas within the Forest (SDGFP unpublished data). Threats to elk include residential and commercial development, poaching, disease, and loss of habitat.

Direct and Indirect Effects
Many of the direct and indirect effects to elk would be the same as those discussed above for deer. Under the no action alternative, habitat effectiveness values would remain above minimum HABCAP values for MA 5.1. Alternatives 2 and 3 would increase summer habitat effectiveness. Winter habitat effectiveness values would remain the same under Alternative 2 and increase

under Alternative 3. HABCAP values for summer and winter by alternative are displayed in Table 3-19.

Table 3-19. Elk Habitat Effectiveness

Standard	No Action	Alternative 2	Alternative 3
Summer = .43	.45	.48	.48
Winter = .34	.43	.43	.46

Cumulative Effects
The 2003 Monitoring Report (USDA Forest Service 2004b) indicates elk populations have increased over the past five years. The SDGFP Annual Report (SDGFP 2004) indicates the population increased in 2004, exceeding objectives established by SDGFP.

The HABCAP model was used to compare Forest-wide habitat capability values from 1997 with 2002. Summer habitat values increased from 66% to 69%, and winter values increased from 62% to 63%. This indicates that elk habitat has slightly improved or remained stable over the last five years (USDA Forest Service 2004b). Forest management activities that have opened conifer stands have improved preferred habitat over time, while roading has decreased security. Actions proposed under Alternatives 2 and 3 would add to the effects of harvest and act against the effects of roading. The action alternatives would improve elk habitat capability and may positively affect Forest-wide trend. Population trend is presently upward. Increased habitat capability values indicate the Forest has also met objective 221. Habitat capability values would improve or stay the same under all action alternatives, thereby meeting objectives for elk.

Brook Trout *(Salvelinus fontinalis)*
Brook trout are an important game species introduced to the Black Hills. They need cold, clean headwater streams and lakes. Brook trout are sensitive to water temperatures above 20°C for extended periods of time and degraded water quality, including low pH, low dissolved oxygen, and sedimentation. Brook trout spawn on gravel and cobble. Eggs are susceptible to mortality from sediment. Management activities that can cause changes in brook trout habitat include livestock grazing in riparian zones, channelization, and sediment from roads and other ground-disturbing activities. Of the streams surveyed by SDGFP within or adjacent to the project area in 1997, 1998, and 2000, brook trout were found in Bear Butte Creek, Boomer Gulch, Spearfish Creek, Strawberry Creek and Whitewood Creek.

Direct and Indirect Effects
Proposed activities would have no direct effects on brook trout. Indirect effects could include exposure of bare mineral soil during road work, timber harvest, and prescribed burning. Reduction in leaf litter and herbaceous plants could result in increased sedimentation. Implementation of BMPs and WCPs would minimize sediment transport due to proposed activities and effects on mountain sucker habitat. Water yield could increase due to reduced transpiration and raindrop interception, but would likely be short-term and immeasurable because of the size of the areas treated and regrowth of vegetation.

Proposed activities would include removal of vegetative cover and soil disturbance during timber harvest, road work, and prescribed burning. These activities can increase sedimentation, concentrate runoff, possibly alter surface and subsurface flow and potentially impact water quality. Potential for negative effects on water quality would be minimized through use of BMP-related design criteria such as surfacing roads with gravel, revegetating exposed soils, and establishing sedimentation traps in drains leading to streams.

Cumulative Effects
Past activities such as road construction, timber harvest, and mining resulted in ground disturbance and vegetation removal. These impacts have decreased over time as revegetation occurred. An adverse effect to aquatic habitat occurs if and when excessive sediment is mobilized and transported into streams. As different units are harvested each year, previous units will have already begun recovery of forest floor vegetation and ground litter from cast leaves and needles.

Impacts on water quality and yield from prescribed fire activity would not be additive to those impacts from timber harvest because they would occur as temporally separate events. If there are effects on water quality from prescribed fire it would be temporally distinct, occurring after timber harvest sites have begun recovery through vegetative re-growth. The effects of sequential prescribed burns within the watershed would depend on their locations and distances from intermittent and perennial streams, but overlap of indirect effects (incremental increases) would probably occur. As with timber harvest, the first areas burned would have begun recovery before subsequent areas are burned, with any effects on water quality expected to last only for one to two growing seasons after the last burn has been achieved. Long-term effects on brook trout are not anticipated because of swift terrestrial vegetative recovery and natural flushing of stream systems through normal rain events.

Proposed activities in combination with past, present, and foreseeable actions would not negatively impact trout provided all planned design features, mitigation measures, BMPs, and Forest Plan standards and guidelines are implemented.

Brown Trout *(Salmo trutta)*
Brown trout is an important game species introduced to the Black Hills. They are widely stocked but also reproduce naturally. Brown trout prefer clear, cold stream headwaters and lakes, although they can survive in deeper, warmer, slower waters than other trout. Temperatures of 22°-28°C are lethal and non-turbid waters are required for egg survival. Management practices that may have adverse effects include reduction of shade over water, channelization, and sedimentation. Of the streams surveyed within or adjacent to the project area by SDGFP in 1997, 1998, and 2000, brown trout were found in Spearfish Creek and Whitewood Creek.

Direct and Indirect Effects
Proposed activities would have no direct effects on brown trout. Indirect effects could include exposure of bare mineral soil during road work, timber harvest, and prescribed burning. Reduction in leaf litter and herbaceous plants could result in increased sedimentation. Implementation of BMPs and WCPs would minimize sediment transport due to proposed activities and effects on mountain sucker habitat. Water yield could increase due to reduced transpiration and raindrop interception, but would likely be short-term and immeasurable because of the size of the areas treated and regrowth of vegetation.

Proposed activities would include removal of vegetative cover and soil disturbance during timber harvest, road work, and prescribed burning. These activities can increase sedimentation, concentrate runoff, possibly alter surface and subsurface flow and potentially impact water quality. Potential for negative effects on water quality would be minimized through use of BMP-related design criteria such as surfacing roads with gravel, revegetating exposed soils, and establishing sedimentation traps in drains leading to streams.

Cumulative Effects
Past activities such as road construction, timber harvest, and mining resulted in ground disturbance and vegetation removal. These impacts have decreased over time as revegetation occurred. An adverse effect to aquatic habitat occurs if and when excessive sediment is mobilized and transported into streams. As different units are harvested each year, previous units will have already begun recovery of forest floor vegetation and ground litter from cast leaves and needles.

Impacts on water quality and yield from prescribed fire activity would not be additive to those impacts from timber harvest because they would occur as temporally separate events. If there are effects on water quality from prescribed fire it would be temporally distinct, occurring after timber harvest sites have begun recovery through vegetative re-growth. The effects of sequential prescribed burns within the watershed would depend on their locations and distances from intermittent and perennial streams, but overlap of indirect effects (incremental increases) would probably occur. As with timber harvest, the first areas burned would have begun recovery before subsequent areas are burned, with any effects on water quality expected to last only for one to two growing seasons after the last burn has been achieved. Long-term effects on brown trout are not anticipated because of swift terrestrial vegetative recovery and natural flushing of stream systems through normal rain events.

Proposed activities in combination with past, present, and foreseeable actions would not negatively impact trout provided all planned design features, mitigation measures, BMPs, and Forest Plan standards and guidelines are implemented.

Snail Species of Concern
Snail species of concern listed in Forest Plan standard 3103 were surveyed by Frest and Johannes (1993, 2002). No high-probability sites for survey were identified in the Mineral project area. No occurrence of these species within the project area has been recorded. No impacts or effects would occur under any alternative.

Migratory Birds

Many species of migratory birds are of international concern due to naturally small ranges, loss of habitat, observed population declines and other factors. The Black Hills National Forest recognizes the ecological and economic importance of birds, and approaches bird conservation at several levels by implementing: (1) Forest Plan objectives, standards and guidelines, (2) a Forest-wide bird monitoring program, and (3) site-specific mitigation and effects analyses for identified species of concern.

A variety of Forest Plan objectives, standards and guidelines further the conservation of migratory birds. Objectives describe desired resource conditions. The most relevant objectives for bird conservation are those relating to vegetation diversity, landscape structural diversity, snags and down woody material, riparian condition, habitat improvements, and disturbance processes (see Forest Plan objectives 201-232). Standards and guidelines are designed to help achieve those objectives, and are implemented at the project-level. The most relevant standards and guidelines to migratory birds are 2101-2109 (Forested Landscapes), 2201-2208 (Hardwoods and Shrubs), 2301-2308 (Snags and Down Woody Material), 2505-2508 (Proper Use or Residual Levels – Riparian/Uplands), 3101-3115 (Endangered, Threatened or Sensitive Species Protection and Management), and 3202-3212 (General Fish and Wildlife Direction).

Bird monitoring is conducted at the Forest level to determine species distribution, abundance, and trend (Panjabi 2001, 2003, 2004, 2005). The monitoring is designed and conducted by the Rocky Mountain Bird Observatory to provide statistically rigorous population trend data for at least 61

species that breed in the Black Hills. Trend data will assist the Forest in determining whether additional conservation measures are necessary.

Species of concern applicable to project-level conservation are identified by many sources including the Endangered Species Act, the Regional Forester's sensitive species list, the Black Hills National Forest MIS list, internal and public scoping efforts, and the US Fish and Wildlife Service's Birds of Conservation Concern (BCC) 2002 publication (US Fish and Wildlife Service 2002). All of these sources and their respective species of concern except the BCC have been examined elsewhere in this document.

The BCC 2002 publication partitions North America into 37 bird conservation regions (BCRs). The Black Hills is included in BCR 17 – Badlands and Prairies. Of the 24 bird species found in BCR 17, eleven are duplicated on the Regional Forester's Sensitive Species list, and are evaluated in the Biological Evaluation if they have potential to occur in the Black Hills. Eight species are not expected to occur in the Black Hills due to lack of habitat. The remaining five species or their habitats have potential to occur in the Black Hills, but only the golden eagle and the red-naped sapsucker or their habitat have the potential to occur in the Mineral project area. They are evaluated below for anticipated effects.

Golden eagle: This species is a cliff- and tree-nesting bird that inhabits open country such as prairies, steep canyons, and savannas (Terres 1987). Contiguously forested habitats and areas lacking cliff structure such as those found within the project area are not preferred by golden eagles, but they may be included in a home range if suitable nesting or foraging habitat is interspersed. The project area contains no substantial cliffs or rock faces that provide typical nesting substrates. Eagles could forage within the larger meadows of the project area, or in adjacent private grasslands; however, none have been detected during recent bird monitoring efforts (Panjabi 2001, 2003, 2004, 2005). Meadow restoration treatments proposed under both action alternatives would have a negligible positive effect on potential foraging habitat due to the small extent of the treatments that would enhance open conditions. No other vegetation treatments or access proposals would have any effect on the eagle or its habitat.

Red-naped sapsucker: This species is associated with aspen groves and mixed pine/aspen (Tallman et al. 2002). The Mineral project area contains 149 acres typed as aspen and many smaller areas of aspen mixed in stands dominated by pine or spruce. The Rocky Mountain Bird Observatory documented 389 red-naped sapsuckers in 2001, 222 in 2002, 245 in 2003, and 212 in 2004 (Panjabi 2005). This baseline data indicates populations are probably stable Forest-wide. Aspen enhancement treatments proposed under both alternatives would increase suitable habitat for the red-naped sapsucker.

3.3.3 Sensitive Plants

This section summarizes the botany specialist's report, located in the project file, which contains data, research references, and detailed analysis of effects on sensitive plants. Project design features and mitigation measures discussed on pp. 13-16 and 23 are intended to ensure that the project meets Forest Plan direction.

Suitable sensitive plant habitats in the Mineral project area include moist white spruce sites, moist paper birch sites, white spruce/paper birch stands, and areas where surface water or other additional moisture is present. The highest quality sensitive plant species habitat is located in the eastern quarter of the project area. Community types present and considered to be high-quality sensitive plant habitat in the project area include white spruce/twinflower forest (*Picea*

glauca/Linnaea borealis), white spruce/grouse whortleberry forest (*Picea glauca/Vaccinium scoparium),* white spruce forest (*Picea glauca*), and paper birch/hazelnut forest (*Betula papyrifera/Corylus cornuta*). White spruce forest is often mixed with paper birch/hazelnut forest. The western portion of the project area does not contain as much high-quality plant habitat due to drier conditions, although a few drainages do support white spruce/twinflower and white spruce/grouse whortleberry communities.

Under both action alternatives, all known occurrences of sensitive plants and all areas considered to be high-quality suitable plant habitat are outside treatment units or would be minimally affected by proposed activities through site-specific design criteria.

Species Documented in the Project Area

Three sensitive plant species are known to occur in the Mineral project area boundary: bristle-stalk sedge, trailing clubmoss, and large round-leaf orchid.

Bristle-stalk Sedge *(Carex leptalea)*

Bristle-stalk sedge is widespread and common in the northern parts of its range (NatureServe 2005). It is found from Labrador to Alaska and south to Florida, Texas, Utah, Colorado, and northern California (USDA 2004a). This species is widely dispersed geographically across the Black Hills and is likely under-reported because it has not been targeted for survey until recently (2003) and there are already over 60 occurrences (USDA Forest Service 2005b). There are three known occurrences in the Mineral project area. All sites are associated with seeps or springs and white spruce.

Under the no action alternative, there would be no direct or indirect effects on bristle-stalk sedge or its habitat since no activities would occur. Under the action alternatives, meadow enhancement would take place about 125 feet from one bristle-stalk sedge site and about 25 feet from another. Under Alternative 2, commercial thinning would take place about 400 feet from another sedge site. These sites would not be entered by heavy machinery. Also under Alternative 2, commercial thinning is proposed in a stand that includes a bristle-stalk sedge site. Design criteria specified on p. 14 would exclude treatment from the sensitive plant site. Due to exclusion from treatment units, there would be no direct effects on bristle-stalk sedge or its habitat under either action alternative.

Indirect effects on individuals and habitat include the potential for noxious weed infestation following ground disturbance. Measures to minimize noxious weed spread (p. 14) would be applied.

Indirect beneficial effects may result from fuel reduction adjacent to bristle-stalk sedge sites. Fuel reduction may reduce the risk of high-intensity wildfire reaching sensitive plant sites, which would benefit the species and its habitat in the long term.

Trailing Clubmoss *(Lycopodium complanatum)*

Trailing clubmoss occurs in boreal regions of Europe and Asia, and in North America from Alaska to Newfoundland and south to Oregon, Wyoming, Minnesota, Michigan, New Hampshire, and Nova Scotia. The species is circumboreal and common across northern latitudes, but disjunct or sparse at the southern limits of its distribution (Hornbeck et al. 2003b).

There are seven known occurrences of trailing clubmoss on the Black Hills National Forest. Six of these occurrences are on the Northern Hills Ranger District. Two occurrences are in the Mineral project area, but neither is in a proposed treatment unit.

In the Black Hills, trailing clubmoss is highly disjunct from the nearest populations in the Rocky Mountains and is restricted to remnant boreal white spruce habitats on steep, north-facing slopes, deep narrow drainages, and streamside benches from 5,000 to 6,340 ft (Hornbeck et al. 2003b, USDA Forest Service 2005c).

Conservation of existing populations is crucial to the persistence of trailing clubmoss in the Black Hills National Forest. The greatest risk to this species in the Black Hills is the small number and limited size of occurrences on NFS lands, which makes it vulnerable to random stochastic events (e.g., floods, drought, fire) and invasive plants that could eradicate an occurrence entirely.

Under the no action alternative, there would be no direct or indirect effects on trailing clubmoss. One of the two occurrences is about 300 feet from a proposed seedcut and noncommercial thinning under both action alternatives. The seedcut is proposed on a south-facing slope over the ridge from the clubmoss site, which is on a north-facing slope. The proposed noncommercial thinning is on the south-facing slope in the same drainage as the clubmoss site. This treatment would be implemented manually by sawyers who would access the site on foot. Motorized vehicles would not enter the drainage. This would eliminate any potential for direct mechanical disturbance to the site and the associated north-facing slope/riparian habitat. These treatments would have a beneficial effect of reducing the risk that wildfire might reach the white spruce stand on the north-facing slope.

Fuel treatments proposed on Strawberry Hill under Alternative 2 would remove beetle-infested trees and thin remaining trees to achieve canopy gaps. The location of these units on the lower part of a slope, where the moisture increases and the stand becomes dominated by white spruce and moss, is suitable trailing clubmoss habitat. Design criteria found on p. 14 would minimize the potential for adverse effects.

Large Round-leaf Orchid *(Platanthera orbiculata)*

This orchid is endemic to the boreal regions of northern North America from Newfoundland to southern Alaska, with a more southern distribution in the eastern United States into the Appalachians and Great Lakes. It occurs as sparse, intermittent occurrences throughout its range (Hornbeck et al. 2003a). In the Black Hills, it primarily occurs as disjunct occurrences in remnant boreal/hardwood forest in the Bear Lodge Mountains of Wyoming and the northwestern limestone plateau and Black Elk Wilderness in South Dakota. Total population in the Black Hills is conservatively estimated at over 700 individuals (Hornbeck et al. 2003a).

This species is present in patchy, scattered occurrences on shady, northwest- to northeast-facing slopes and draws in strong association with paper birch, hazelnut, and white spruce forests. The single known site in the Mineral project area is on a slope over a tributary feeding into Icebox Gulch. The community is dominated by overstory ponderosa pine, with white spruce regeneration and an understory dominated by grouse whortleberry (USDA Forest Service 2005c). This habitat is unique for this species, which is generally associated with mid- to late-successional paper birch/hazelnut forest.

Under the no action alternative, there would be no direct or indirect effects on large round-leaf orchid or its habitat. Neither action alternative proposes any activities at the known occurrence. The site is near several units proposed for prescribed burns and commercial thins, but the units are at least 250 feet from the site. The proposed treatments would occur on different aspects and in different community types than the occurrence, which would further reduce the possibility of impacting potential additional individuals. It is therefore anticipated that neither action alternative would have any direct effects on the known occurrence of large round-leaf orchid.

Indirect effects on individuals and habitat include the potential for noxious weed infestation following ground disturbance. Measures to minimize noxious weed spread (p. 14) would be applied.

Indirect beneficial effects may result from fuel reduction adjacent to large round-leaf orchid sites. Fuel reduction may reduce the risk of high-intensity wildfire reaching sensitive plant sites, which would benefit the species and its habitat in the long term.

Cumulative Effects

The cumulative effects area for this analysis is suitable habitat for bristle-stalk sedge, trailing clubmoss, and large round-leaf orchid in the project area. For this project, suitable habitat for these species is defined as moist meadows, mesic white spruce forest, mesic white spruce/paper birch forest, mesic paper birch/hazelnut forest, and moist to saturated conditions adjacent to perennial streams.

Implementation of the no action alternative could contribute to negative cumulative effects on these three species. Suppression of fire has had negative cumulative effects such as increased fuel loading, which can further change microsite moisture and hydrologic regimes. Continuing fire suppression without vegetation management could result in further fuel load increases. In addition, lack of treatment could contribute to unusually intense wildfire behavior when a fire does occur. Areas that would not normally burn (e.g., moist areas considered high-probability sensitive plant habitat) could ignite and burn at unusually high temperatures. This could result in a loss of sensitive plant habitat or sensitive plant populations.

Implementation of the no action alternative would not contribute to the spread of invasive species and noxious weeds resulting from soil disturbing activities. Under Alternatives 2 and 3, mechanical treatments, prescribed burns, and road building and reconditioning could contribute to soil disturbance and the spread of invasive species in treatment units in the proximity of the sensitive plant species sites. Invasive species, including noxious weeds, can out-compete desired plants, and spray from herbicides used to control weeds can also have negative effects on sensitive plants. The magnitude of potential negative indirect effects/cumulative effects of the spread of invasive species would be approximately twice as high for Alternative 2 as Alternative 3, because there are approximately twice as many acres of vegetation treatments that could potentially spread weeds. This comparison is very generalized because potential negative effects would vary with proximity to actual high-quality sensitive plant habitat on the ground, presence of a weed source, and extent of ground disturbance. Standards and guidelines in the Forest Plan and the Phase 1 Amendment for noxious weeds and would help reduce indirect and cumulative effects of weed encroachment. Noxious weed guidelines to prevent the spread of noxious weeds for prescribed fire, road maintenance/rehab, and timber harvest activities are identified in the BHNF Weed Management Plan and would be included, as appropriate, in all contracts and permits issued as part of this project.

Risks

The risk to bristle-stalk sedge, trailing clubmoss, and large round-leaf orchid from implementing the no action alternative is low because no actions would take place and it is suspected that ecological processes would continue unaltered in the short-term. The risk to these three species from implementing either action alternative is low because areas of suitable habitat were identified and surveyed or assessed within the project area and no sensitive plant populations or high-quality suitable habitat for these species would be treated under either action alternative. Although negative impacts from implementing this project are possible, they are expected to be outweighed by the beneficial effects of reducing the risk of stand-replacing wildfires. Risks can be reduced in some cases by management efforts to alter forest structure and decrease fuel loads

(Graham et al. 2004). Various methods of vegetative treatment are proposed in this project that would reduce fuel loading, and this could help prevent a stand-replacing fire from getting into and having major negative effects on the high-quality suitable habitat both within and outside of the project area.

Determinations
Determinations for bristle-stalk sedge, trailing clubmoss, and large round-leaf orchid:

Due to the potential for indirect and cumulative effects, and the low risk as described above, these species are assigned a determination of "May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing" for all alternatives.

Species with Suitable Habitat in the Project Area

Species with suitable habitat in the project area but with no known occurrences include small-flowered columbine *(Aquilegia brevistyla)*, leathery grapefern *(Botrychium multifidum)*, yellow lady's slipper *(Cypripedium parviflorum)*, and highbush cranberry *(Viburnum opulus* var. *americanum)*. In the Black Hills, the primary habitat for these species is riparian communities and/or moist forested communities. Although the Mineral project area has suitable habitat for the species listed above, none of them were found within the project area during surveys. The habitat addressed under the effects analysis for sensitive plant species known to occur in the project area addresses the habitat for these four species.

Determination
Implementation of this project may adversely impact individuals of the four species in question, but is not likely to result in a loss of viability in the planning area nor cause a trend toward federal listing.

Species with Possible Suitable Habitat in the Project Area

Narrowleaf Grapefern *(Botrychium lineare)*
Historical and current occurrences of narrowleaf grapefern have been documented in Idaho, Oregon, Montana, California, Washington and Colorado, and in Quebec, New Brunswick, and British Columbia, Canada. Based on new occurrence information (2003 and 2004) and continued herbarium searches of historic vouchers, the species is also now documented from Utah, Wyoming (Black Hills occurrence), Alaska, the Yukon Territory, and Glacier National Park, Montana (USDA Forest Service 2004e).

Typically, *Botrychium* species are long-lived (10 to 15 years), colonizing plants that may require disturbed sites to become established. This is consistent with the narrowleaf grapefern occurrence conditions in the Black Hills. This species may be a habitat generalist since habitat across its range is quite variable and its range stretches from sea level in Quebec to approximately 10,000 feet in Colorado. Narrowleaf grapefern has been observed growing in primarily open habitats, often where disturbances have occurred (USDA Forest Service 2004e).

Baseline inventory documentation of the *Botrychium lineare* occurrence on the Black Hills shows habitat similarities and differences compared to occurrences elsewhere. The Black Hills occurrence is located on an open, sunny, old native-surface roadbed dominated by graminoids and forbs. Slopes immediately adjacent to the roadbed are dominated by paper birch and bur oak with a thick shrub layer of hazelnut.

Risks
There is uncertainty regarding risks to narrowleaf grapefern. Disturbances and land management activities may create and maintain suitable habitat for this species or they may negatively impact existing populations, depending on the disturbance intensity and frequency (USDA Forest Service 2004e).

Determination
Because of the uncertainties and limited information for this species in the Black Hills and in the Rocky Mountain region, it is difficult to assess whether the activities associated with this project would have no effect, a potential adverse effect, or a potential beneficial effect on narrowleaf grapefern. Based on the information that is available, a determination of "May adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend toward federal listing" is made for this species. The rationale for this determination is based upon the following:

1. The 2003 narrowleaf grapefern occurrence is not located within the Mineral project area and would not be disturbed by the activities associated with the project. While the full extent of the distribution of this species in the Black Hills is not known, the appearance of aboveground sporophytes at the new site is indicative of a viable population with extensive supporting underground biomass (including mycorrhizae) (Farrar 2004). Therefore, while loss of individuals may occur in any currently unknown sites (although there may not be any) in the Mineral project area, the viable population at the known occurrence site would not be affected.
2. Baseline data for the 2003 occurrence documents that the species is able to colonize past disturbance areas, and the species is currently persisting at the known occurrence with limited ongoing disturbances (USDA Forest Service 2004e).
3. Canopy of some ponderosa pine stands in the project area would be opened, which could create habitat for narrowleaf grapefern. Although specific data is lacking on the Black Hills National Forest, the earlier successional conditions that occur with opening the overstory canopy could produce conditions that may be beneficial to site colonization by this wind-dispersed, spore-producing species, if the associated mycorrhizal species and other microsite conditions are present (USDA Forest Service 2004e).
4. Despite the fact that aboveground stems may be negatively affected, beneficial short- and long-term effects may result from the proposed 1,125 acres of prescribed burning. Prescribed fire may provide the disturbance needed for site colonization and persistence. When an occurrence has aboveground growth, a fast-moving fire may not negatively impact it. The fire may remove above-ground stem portions, but would not be expected to affect below-ground individuals or parts. An intense fire that causes deep soil heating may negatively affect both the below-ground and above-ground portions of individuals of this species (USDA Forest Service 2004e). If unknown occurrences exist in the project area, creation or maintenance of low crown-fire hazard conditions would reduce the likelihood of occurrence loss associated with a high intensity fire.
5. It can be expected that noxious weeds would be treated in the Mineral project area. Although uncertainty exists, weed competition as well as herbicide application are considered to be potential risks to this species.

3.3.4 Noxious Weeds

This section summarizes the noxious weed specialist's report, located in the project file, which contains data, research references, and detailed analysis of effects on noxious weeds. Project design features and mitigation measures discussed on pp. 13-16 and 23 are intended to ensure that the project meets Forest Plan direction.

Noxious weeds are non-native plants that aggressively invade, or are detrimental to, native plant communities and ecosystems. They crowd out native plants and animals and reduce the land's productivity. Left untreated, the weeds would continue to spread, resulting in the establishment of new populations in adjacent areas.

Current inventory indicates that there are about 754 acres of noxious weeds in the project area, including the following species: leafy spurge (112 acres), common tansy (18 acres), St. Johnswort (21 acres), houndstongue (116 acres), yellow toadflax (30 acres), spotted knapweed (37 acres), and Canada thistle (420 acres).

Direct and Indirect Effects

There would be no appreciable direct effects on noxious weeds under the no action alternative. Current weed infestations would continue to exist, along with weed-control work (as funded) to keep them from expanding. In the event of a wildfire, there could be additional soil disturbance that could result in increasing noxious weed concerns.

Under the action alternatives, noxious weed infestations would be a potential risk associated with timber harvest activities. Noxious weeds often become established in disturbed soil. They are easily picked up and transported by vehicles and then scattered along roads where they become further established. Weed infestations displace and fragment native plant communities, which in turn reduces suitable forage for wildlife and livestock, reduces protective soil cover, and detracts from human enjoyment of the forest. Alternative 2 would have the greatest potential for noxious weed infestation based on the acres of commercial harvest, road reconstruction or construction, and prescribed fire. Alternative 3 would have less potential for infestation than Alternative 2 because it involves less commercial harvest and road work. Design criteria for both alternatives (p. 14) are included to minimize expansion of noxious weed infestation.

Cumulative Effects

Historically, noxious weeds arrived in the Black Hills via contaminated hay, livestock, vehicles, and many other vectors. Soils disturbed by timber harvest, roads, fires, livestock grazing, development, and mining are often colonized by noxious weeds. The proposed actions would disturb the ground through timber harvest, roadwork, and prescribed burning, and could add to these cumulative effects. Road closures could decrease opportunities for weed spread. Design criteria identified on pp. 13-16 and 23 are intended to minimize the potential for noxious weed spread and would ensure the incremental cumulative effect on noxious weeds associated with this project is minor.

3.3.5 Rangeland

This section summarizes the range specialist's report, located in the project file, which contains data, research references, and detailed analysis of effects on rangeland resources.

The project area includes portions of three different grazing allotments. The Ragged Top allotment is currently vacant and there are no plans to change this status. Cattle graze the remaining two allotments, Bear Butte and Upper Elk Creek, under permit from June through September.

Direct and Indirect Effects

All alternatives would have limited effects on range resources. In the near future, proposed treatments could increase secondary forage available for livestock. This would be most evident under Alternative 2, which involves treatment of the most acres. Design criteria identified on p. 14 would minimize impacts to rangeland resources.

Cumulative Effects

Meadow acreage has decreased over the years as conifers have encroached on open areas. The proposed actions, including aspen and hardwood enhancements and fuel treatments, would increase forage temporarily in harvested and burned stands, but would not permanently convert any areas to meadow. The incremental change to cumulative effects on rangeland resources associated with this project would be negligible.

3.4 Social Consequences

3.4.1 Economics

Figures generated by economic analysis of timber projects are usually used as a means to compare alternatives (rather than as an absolute measure) because timber prices tend to fluctuate widely. There is no way to predict the probable price at which a future timber sale would sell, and actual economic efficiency of this project depends on that factor.

Direct, Indirect, and Cumulative Effects

Economic analysis of Alternatives 2 and 3 using current stumpage rates indicates that revenues would exceed costs. The highest costs are associated with road construction and reconstruction, prescribed burning, manual fuel treatments, and precommercial thinning.

Various costs and benefits were not included in this analysis. Some of these, such as recreational activities, take place across the Forest and the Black Hills region. Recreation has an economic effect on local communities, but there is insufficient information to determine this specific project's contribution to this effect. Fuel reduction projects are costly in the short term, but the cost of a wildfire that may have been prevented by the fuel reduction could be exponentially higher. This cost is difficult to fully take into account in economic analysis. Other non-market factors, such as the value of habitat for rare species, are difficult to quantify and compare directly to commodities.

The economic analysis was generated using Quick Silver, a Forest Service economic analysis program customized for the Rocky Mountain Region and the BHNF. Present net value (the future benefit of the project discounted to the present) is approximately $266,000 for Alternative 2 and $171,000 for Alternative 3. The benefit/cost ratio is 1.42 for Alternative 2 and 1.48 for Alternative 3, indicating economic benefits are likely to exceed costs.

The Black Hills area economy was dominated by mining, timber harvest, and agriculture for many years. The region's economy is now well diversified, but the future of some timber operators in the highly competitive forest products industry continues to be uncertain. The proposed actions would contribute to the local economy by producing forest products and employment and through procurement of services and products associated with project implementation.

3.4.2 Environmental Justice

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," provides that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, polices, and activities on minority populations and low-income populations." It further requires that Federal agencies conduct its activities in a manner that does not discriminate against individuals or populations because of race, color, or national origin.

There are no communities with low-income or minority populations in the project area. No activities related to this project would disproportionately affect or discriminate against any individual and/or population. All federally recognized Native American tribes with an interest or historical connection in the study area were notified during scoping for the project. No comments were received. Specific environmental justice concerns were not identified. Additional information on sociological and economic effects of management of the BHNF is available in the Forest Plan FEIS (USDA Forest Service 1996 p. III-457).

3.4.3 Recreation

This section summarizes the recreation specialist's report, located in the project file, which contains data, research references, and detailed analysis of effects on recreation resources. Project design features and mitigation measures discussed on pp. 13-16 and 23 are intended to ensure that the project meets Forest Plan direction.

Developed recreation facilities in the project area include portions of snowmobile trails 5A and 7A, portions of the George S. Mickelson Trail, the Strawberry Picnic Ground, and the observation deck at the summit of Terry Peak. There are also several privately owned commercial recreation facilities in the project area, including campgrounds, a golf course, stores, and parts of the Terry Peak and Deer Mountain ski areas.

Auto travel and driving for pleasure are the most popular forms of dispersed recreation in the project area. Hunters also use the area during annual hunting seasons. U.S. Highways 85 and 385 cross or border portions of the project area, and there are other popular county or Forest routes such as the Terry Peak summit road. The number of non-National Forest System roads or trails in the project area has increased over time, as more individuals use the forest for motorized recreation. Many of the non-NFSRs and a few of the existing NFSRs currently used for dispersed recreation are not needed to support Forest management work. Some of the NFSRs are located parallel to each other and access the same areas.

The Recreation Opportunity Spectrum (ROS) class for MA 5.1 is Roaded Natural. These areas are characterized by predominantly natural-appearing environments with moderate evidence of the sights and sounds of people. Such evidence usually harmonizes with the natural environment.

Interactions between users may be moderate to high, with evidence of other users prevalent. Resource modification and use are evident but harmonize with the natural environment. Conventional motorized use is allowed and incorporated into construction standards and design of facilities.

Direct and Indirect Effects

Under the no action alternative, current recreation uses, trends, and degrees of visitor enjoyment would likely continue in the short term. There would be no immediate change in the current number or amount of roads or trails, and unmanaged, non-National Forest System routes would probably continue to develop over time as a result of continued current uses. Those participating in activities that currently contribute to the development of non-NFS routes may see this as a benefit up to a certain point. Others who are seeking solitude or naturalistic settings may experience an adverse effect.

Under Alternative 2, proposed activities may temporarily affect recreation use in and around the treatment units. Short-term direct effects include increased logging truck traffic, smoke, and visual and auditory distraction along major NFSRs. These effects would mainly apply to recreational ATV users and hunters in fall. If winter logging is permitted, snowmobile use off the maintained trails may be affected as well. With implementation of design criteria (p. 15), the effects would be minor and of a short duration.

Long-term effects of treatment harvest would enhance recreational opportunities by providing a more biologically and visually diverse landscape. After project completion, increased forage would contribute to wildlife habitat improvement, and the forest canopy would be opened up in some areas, providing improved viewing depth into the Forest. These factors together may contribute to an improved recreational experience for Forest travelers and hunters.

Closing or decommissioning certain roads, as proposed, would reduce motorized routes currently used by some hunters and ATV users. There are currently about 36 miles of open road on NFS lands in the project area. After implementing Alternative 2, the project area would contain about 24 miles of open road on public land. Under this future condition, the greatest distance from any point in the project area to an open public road would be approximately one mile. This relatively low figure is due to the large amount of private land intermixed with public lands in and around the project area.

Recreation effects of Alternative 2 were qualitatively assessed using the ROS classification system, evaluation of logging effects, and the intensity and duration of harvesting activities as they relate to the recreational experience in the project area. With the design criteria identified on p. 16, this alternative would meet the standards of the Roaded Natural ROS class.

The effects of Alternative 3 would be substantially the same as those of Alternative 2 and would meet the standards of the Roaded Natural ROS class. Because this alternative would produce better habitat for big game animals than the proposed action, hunting enjoyment and success could be enhanced. The only other notable difference is that this alternative would cause somewhat less overall change from the current condition. Consequently, the magnitude of likely effects on general recreation (both beneficial and adverse) would be slightly less under this alternative than under Alternative 2.

Cumulative Effects

Construction and improvement of roads over the years has decreased opportunities for some types of non-motorized recreation. Current open road density is about 4.1 miles of road per square mile

of land. Although some users view the roads as important to provide recreational access, other users feel the roads detract from their recreational experience.

Unauthorized roads and trails often result as landowners use adjacent National Forest System land for recreation. Motorized use (ATVs, motorcycles, etc.) is likely to continue to increase in popularity. Thus, without active management of existing non-NFSRs and the prevention of new user-created roads, resource damage would gradually increase and adversely affect non-motorized recreational enjoyment of the area. Both action alternatives would, however, decommission eight to ten miles of non-NFSRs and one to two miles of NFSRs not needed for Forest administration. Enough roads would remain to meet the demands of most forest recreational users. Cumulative effects on recreation under any alternative would be minimal.

3.4.4 Scenery

This section summarizes the visual resource specialist's report, located in the project file, which contains data, research references, and detailed analysis of effects on visual resources. Project design features and mitigation measures discussed on p. 16 are intended to ensure that the project meets Forest Plan direction.

Most of the project area is covered with ponderosa pine. Harvesting the pine over time in this area has led to a manipulated landscape with an extensive network of roads. This has become the accepted, natural landscape to the surrounding communities of the area and forest users. The landscape has also been influenced with the developments of the historic mining districts, particularly in areas surrounding Lead and Deadwood.

The project area is a patchwork of National Forest System lands and private lands, which serve as a backdrop for the communities within or adjacent to the project area. This includes Deadwood, Lead, Galena, and their subdivisions. Some of the private lands are vacant property, while other parcels are used for residential or business purposes.

The majority of individuals who view the project area do so from the major travel routes, including U.S. Highways 85 and 385 and Forest Highway 17.

Numerous federal laws require all federal land management agencies to consider scenery and aesthetic resources in land management planning, resource planning, project design, implementation, and monitoring.

Direct and Indirect Effects

Under the no action alternative, existing conditions and natural processes of trees growing and regenerating would continue. Dense stands of trees would continue to move towards a denser character and the visual depth into the Forest from roads and trails would gradually decrease, except where mountain pine beetle activity increases with the lack of vegetative treatment; this could produce additional stands of dead trees scattered across the landscape. Current fire suppression strategies would limit the natural role of fire in the landscape and also help create a denser forest. The denser forest and dead trees associated with beetle infestations could increase the potential for a major wildfire. A major wildfire has the potential to change the existing scenic environment to one of bare soils and dead trees.

Both action alternatives include vegetation treatments that would affect the scenic integrity of the area. Effects under both action alternatives would be similar, but the effects of Alternative 2 would generally be of a greater magnitude due to the greater area treated. Slash and stumps

would be created and soil disturbance associated with skid trails, landings, and staging areas would be evident in the short term. Treatments that remove the highest percentage of large trees would generally have the greatest effect on scenic integrity. Overstory removals would generally remove the highest percentage of large trees and would cause an obvious change in stand appearance. Design criteria identified on p. 16 would ensure that proposed treatments meet Forest Plan scenic integrity objectives.

Other treatments would be less evident. The proposed commercial thinning treatments (1,350 acres in Alternative 2 and 592 acres in Alternative 3) would create opportunities for grasses and shrubs to create a more diverse vegetative matrix in the landscape. Understory grasses and shrubs, as well as the larger trees, would be more evident, offering a variety of light, color and texture. Both action alternatives include hardwood enhancement, which would remove the conifers from hardwood stands and increase the amount of hardwoods in the project area. Both meadow and hardwood enhancement treatments would increase vegetative diversity, which is an integral part of the landscape character of an area, and would also create more spring and fall color in the landscape.

Cumulative Effects

Past vegetation treatments in the form of open areas are generally not evident from the main roads in the project area. Because of the rolling nature of the terrain, areas of past vegetation treatment are not highly visible.

The project area displays evidence of past treatments and, because of its close proximity to Lead and Deadwood, has been heavily influenced by humans. Under any of the alternatives, a mosaic of tree densities and vegetation types would be evident. The overstory removal treatments would move the forest toward a young but dense forest which may result in a lower scenic intergrity. Commercial thins, fuel treatments, and hardwood restorations would have a moderate to high scenic integrity. The incremental change in cumulative effects under any alternative would be negligible.

3.4.5 Heritage Resources

This section summarizes the heritage specialist's report, located in the project file, which contains data, research references, and detailed analysis of effects on heritage resources. Project design features and mitigation measures discussed on pages 13-16 and 23 are intended to ensure that the project meets Forest Plan direction.

The project area contains numerous historic and prehistoric cultural resource sites representing occupation and use of resources in the northern Black Hills. The majority of sites relate to historic period mining activity, transportation systems, and cabin dwellings.

Of the 5,798 acres in the Mineral project area, approximately 5,525 acres have been field inventoried with Level III Heritage Resource coverage. Most of the work was completed during the 1999-2002 field seasons. The acreage that was not surveyed includes small parcels that would not be affected by project activities. As a result of these surveys, 14 cultural resource properties were evaluated as eligible or potentially eligible for nomination to the National Register of Historic Places (NRHP). An additional 40 cultural resource properties have been evaluated as not eligible for nomination to the NRHP.

Direct and Indirect Effects

There would be no effects on heritage resources attributable to the no action alternative. Under the action alternatives, potential effects could occur in association with road construction, road reconstruction, road decommissioning; timber harvest with heavy equipment, and fuel reduction activities.

Under Alternative 2, three of the eligible or potentially eligible heritage sites are located within or adjacent to treatment areas. Under Alternative 3, two sites are located within or adjacent to treatment areas. No effects are anticipated on heritage resources under either of the action alternatives provided all eligible and potentially eligible properties, Traditional Cultural Properties, and culturally significant areas are avoided or effects mitigated as described in the Heritage Report and Chapter 2 of this document.

Indirect effects from project activities include potential erosion that could expose cultural resources. Exposing these areas could promote access of recreational vehicles and possibly vandalism. The proposed decommissioning of roads under both alternatives would help to alleviate this concern. Additionally, removal of vegetation and cover within these areas may promote a change in conditions that could lead to further erosion from natural elements. The proposed decommissioning of roads under both alternatives would help to alleviate this concern.

Mitigation measures for the project were developed in consultation with the South Dakota State Historic Preservation Office, Native American Tribal Historic Preservation Offices, and other applicable interested parties. The South Dakota Historic Preservation Office concurred on May 7, 2003 with the determination that there would be no effect on heritage resources provided the identified mitigation measures are included in the project (SHPO Project Number 030418004F). The Forest would be in compliance with Section 106 of the National Historic Preservation Act under each alternative, for all proposed activities.

Cumulative Effects

Adverse cumulative effects to heritage resources on and around the National Forest result from the advances of time (such as weathering/erosion), destruction through development, inadequate or inappropriate maintenance, and vandalism. As a result, the research value of heritage resources can disappear. The proposals being considered under this action have the potential to cumulatively impact heritage resources, but by avoiding or mitigating effects on all cultural properties, no cumulative impacts are expected to occur under any alternative.

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APPENDIX A - INDEX

APPENDIX B - BIBLIOGRAPHY

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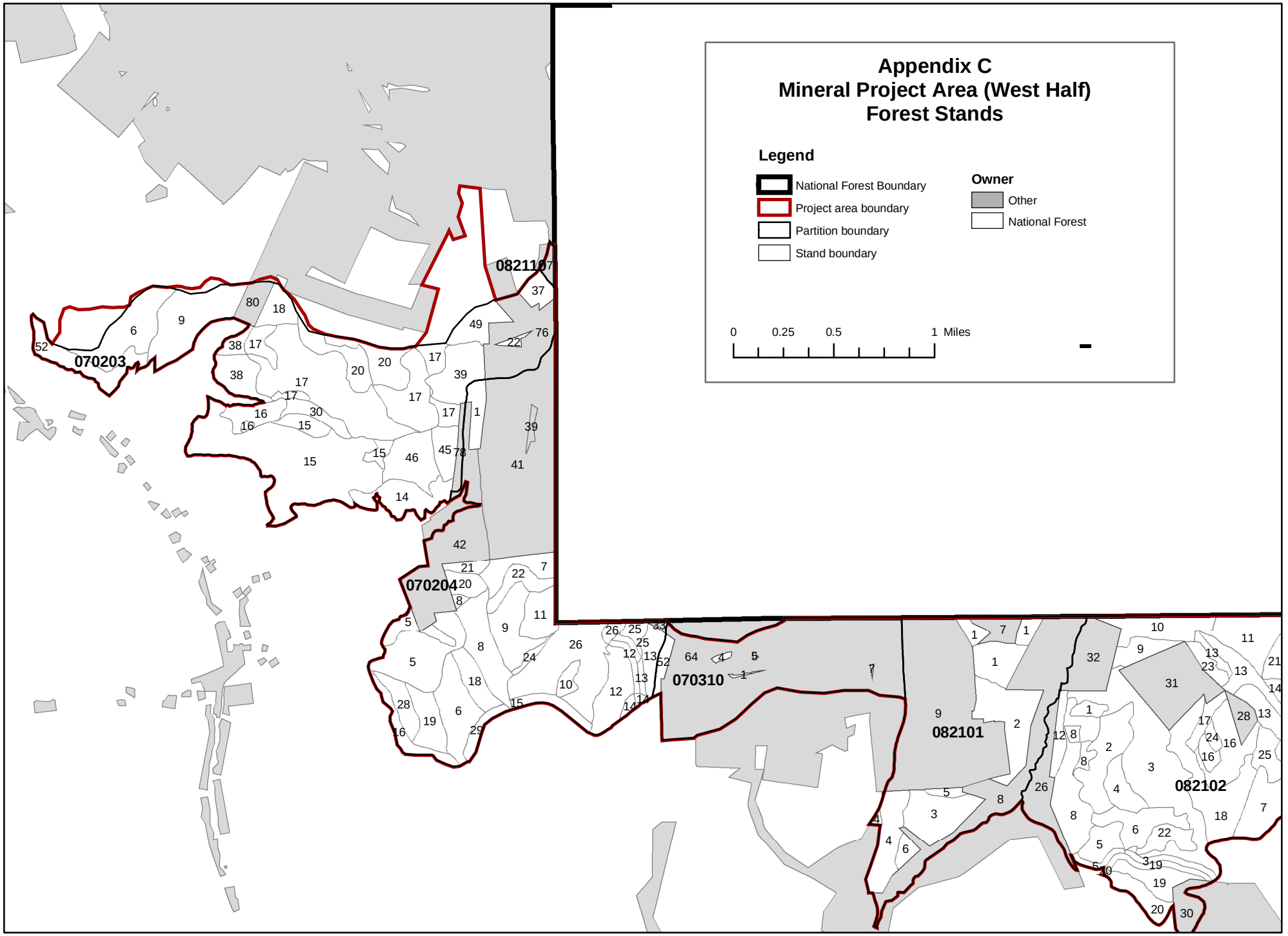
APPENDIX C – STAND MAP


Appendix C
Mineral Project Area (West Half)
Forest Stands
Legend
National Forest Boundary
Project area boundary
Partition boundary
Stand boundary
Owner
Other
National Forest
0 0.25 0.5 1 Miles
070203
070204
070310
082101
082102
082110

Appendix C
Mineral Project Area (East Half)
Forest Stands